REMEDIAL ACTION WORK PLAN

for

130 SAINT FELIX STREET SITE
Brooklyn, New York
NYSDEC BCP Site No. C224306

Prepared For:

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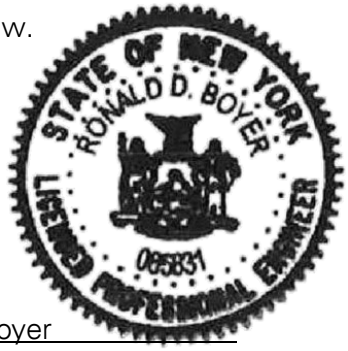
August 2024
Langan Project No. 100842301

LANGAN

CERTIFICATION

I, Ronald D. Boyer, certify that I am currently a Professional Engineer as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan (RAWP) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) and DER Green Remediation (DER-31).

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.



Ronald D. Boyer	8/7/2024	
NYS Professional Engineer #085831	Date	Signature

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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AST	Aboveground Storage Tank
AWQSGVs	Ambient Water Quality Standards and Guidance Values
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	Below Ground Surface
BOA	Brownfield Opportunity Area
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylene
C/D	Construction/Demolition
CAMP	Community Air Monitoring Program
CCR	Construction Completion Report
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
CQAP	Construction Quality Assurance Plan
COC	Contaminants of Concern
COD	Chemical Oxygen Demand
CPP	Citizen Participation Plan
CSM	Conceptual Site Model
CVOC	Chlorinated Volatile Organic Compound
DER	Division of Environmental Remediation
DMM	Division of Materials Management
DO	Dissolved Oxygen
DOT	Department of Transportation
EC	Engineering Control
el	Elevation
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
ESA	Environmental Site Assessment
EI	Environmental Investigation
eV	Electron Volt
FEMA	Federal Emergency Management Agency
FER	Final Engineering Report
FWRIA	Fish and Wildlife Resources Impact Analysis
GPR	Ground Penetrating Radar

Acronym	Definition
IC	Institutional Control
IRMWP	Interim Remedial Measures Work Plan
ISCO	In-Situ Chemical Oxidation
µg/L	Microgram Per Liter
µg/m^3	Microgram Per Cubic Meter
mg/kg	Milligram Per Kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MTBE	Methyl tert Butyl Ether
NAVD88	North American Vertical Datum of 1988
NYCRR	New York Codes, Rules and Regulations
NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
NYCOER	New York City Office of Environmental Remediation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	Oxidation-Reduction Potential
OSHA	United States Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PFAS	Per- and Polyfluoroalkyl Substances
PG	Protection of Groundwater
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	Parts per million
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCA	Recycled Concrete Aggregate
RCRA	Resource Conservation and Recovery Act
RE	Remediation Engineer
REC	Recognized Environmental Condition
RI	Remedial Investigation

Acronym	Definition
RIR	Remedial Investigation Report
RUSCO	Restricted Use Soil Cleanup Objective
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SMDS	Sub-Membrane Depressurization System
SMMP	Soil/Materials Management Plan
SMP	Site Management Plan
STARS	Spills Technology and Remediation Series
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
TOGS	Technical and Operational Guidance Series
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This Remedial Action Work Plan (RAWP) was prepared on behalf of 130 St. Felix Street LLC (Owner), for the proposed development located at 130 Saint Felix Street (portion of Block 2111, Lot 40) in the Fort Greene neighborhood of Brooklyn, New York (the Site). The Owner has enrolled in the New York State Brownfield Cleanup Program (BCP) as a Volunteer and will implement this RAWP pursuant to the Brownfield Cleanup Agreement (BCA) executed on 7 July 2020 and amended on 16 December 2022 with the New York State Department of Environmental Conservation (NYSDEC). The site was assigned BCP Site No. C224306. The BCP Site was originally 0.288 acres but was reduced in a 17 December 2022 BCA Amendment to 0.273 acres due to the inability to remediate in the vicinity of generators, which could not be readily removed. The amendment also included proof that the Site would be developed into 30% Mandatory Inclusionary affordable for sale condominium housing for purposes of receipt of the tangible tax credit component of the BCP tax credits.

This RAWP summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI) work completed by Langan, provides evaluations of Track 1 and Combined Track 2 and Track 4 remedies and associated costs, and recommends the preferred remedy. The remedy was selected consistent with the procedures defined in DER-10 and complies with applicable standards, criteria, and guidance, as well as with applicable federal, state and local laws, regulations and requirements.

Site Description/Physical Setting/Site History

The Site is located in the Fort Greene neighborhood of Brooklyn, New York and is identified as a portion of Block 2111 Lot 40. The Site is an approximately 0.273 acres (11,895 square-foot) parcel and is currently an at-grade asphalt paved parking lot that has been used as such since at least 1950. The original BCP Site acreage was 0.288 acres but was slightly reduced pursuant to a BCA Amendment by 0.15 acres due to the presence of generators in a Generator easement, which were too difficult to move, and thus this small area was eliminated from the BCP Site pursuant to a BCA Amendment executed on 17 December 2022. An easement in the southwest corner of Lot 40 provides the adjacent property (1 Hanson Place) access to its generator, which is also located on Lot 40. This generator easement area is excluded from the BCP Site. The BCP Site is subject to other easements providing 1 Hanson Place with access to the Site, including a loading area easement in the western portion of Lot 40. The Site is bound to the north by a four-story building occupied by the Brooklyn Music School and a seven-story building occupied by the Brooklyn Academy of Music; Saint Felix Street followed by five 2.75- to three-story residential

buildings to the east; the 41-story mixed-use residential/ commercial Williamsburg Savings Bank Tower (1 Hanson Place) and associated generators and a three-story church building to the south; and Ashland Place followed by a 31-story mixed-use residential/commercial building to the west. The Site is located within a commercial zoning district (C6-1) and is designated for garage/gas station use (G6) by the New York City Department of Finance. The Owner applied for a Zoning amendment to change from a C6-1 district to a C6-6 district on the western half of the Block to a depth of 250 feet from Hanson Place, and from C6-1 to C6-4 on the eastern half of the Block to a depth of 330 feet from Hanson Place within the Special Downtown Brooklyn District. This zoning map amendment received a Negative Declaration and Statement of No Significant Effect on 3 May 2021 and was approved on 10 December 2021. As part of the City Environmental Quality Review (CEQR) rezoning process, an E-designation (E-616) was placed on Block 2111, Lot 40 for air quality, window wall attenuation and alternate ventilation, and hazardous materials.

Based on review of previous environmental assessments and investigation reports prepared for the Site (listed in the subsequent section) and of available records maintained online by the New York City Department of Buildings (NYCDOB), historical use and features of the Site identify that the Site was an at-grade asphalt-paved parking lot since at least 1950 and may have contained underground storage tanks (USTs) due to the Site's classification as a garage/gasoline station, which may be the source of PAH and VOC impacts identified in soil, groundwater and/or soil vapor. Historical operations at adjacent and surrounding properties include manufacturing, dry-cleaning and laundry, automobile sales, and a gasoline filling station. Dry cleaning facilities were identified at properties hydraulically upgradient and between 500- and 900-feet of the Site at 696 Fulton Street, 711 Fulton Street, and 85 Lafayette Avenue. A hydraulically downgradient dry-cleaning facility was identified 1,200-feet from the Site at 64 Fourth Avenue. At the adjacent property to the south located at 1 Hanson Place, a tank failure resulted in a fuel oil release that was reported to NYSDEC in 2004 and was administratively closed in 2015.

Based on a March 2021 survey prepared by True North Surveyors, Inc., existing Site grade ranges from about el 43.9 to el 49.32 North American Vertical Datum of 1988 (NAVD88).

Summary of the Remedial Investigation Findings

The findings summarized herein are based on qualitative data (field observations and instrumental readings) and laboratory analytical soil, groundwater, and soil vapor sample results collected during the 2015 Subsurface Investigation (2015 SI) performed prior to the Site's acceptance into the BCP and the 2021 Remedial Investigation (RI) completed as part of the BCP.

1. Stratigraphy: A contaminated non-native soil layer as deep as 13 feet is generally underlain by a native sand layer that was consistently encountered until boring termination depth across the site. Gravel layers, within the native sands, ranging in thickness from approximately 1 to 5 feet were also identified between approximately 26.5 and 40 feet bgs within two soil borings advanced in the eastern portion of the Site. Bedrock was not encountered in any of the soil borings advanced during the 2015 SI or the 2021 RI.

2. Hydrogeology: Groundwater was encountered at elevations ranging from el 2.25 to 2.85 NAVD882, corresponding to 38.79 and 41.98 feet below ground surface (bgs), during the RI. Based on observed groundwater elevations, groundwater flow is to the south/southwest towards the Gowanus Canal.

3. Soil Quality: Up to 13 feet of contaminated non-native material was identified below surface cover. Odors were observed in soil between 7 and 8 feet bgs at one location in the northeast portion of the Site. No elevated PID readings or visual or olfactory evidence of impacts were observed in any of the remaining soil borings or test pits. Contaminants identified include VOCs, SVOCs, metals, and pesticides, which were detected at concentrations above Unrestricted Use Soil Cleanup Objectives (UUSCOs), Restricted Residential Restricted Use Soil Cleanup Objectives (RRSCOs), and/or Protection of Groundwater Soil Cleanup Objectives (PGWSCOs) within this layer. Contaminants identified in soil samples collected from directly beneath the contaminated non-native material/native material interface and deeper within the native material at the two-foot interval below the proposed redevelopment depth (i.e., 20 to 22 feet bgs) include metals detected at concentrations above the UUSCOs, only. Contaminants at concentrations above UUSCOs, RRSCOs, or PGWSCOs were not identified in deep native soil samples collected from the two-foot interval above the observed groundwater interface (i.e. either 40 to 42 feet bgs or 42 to 44 feet bgs). Elevated concentrations of PAHs, metals, and pesticides in near-surface material are attributable to historic operations at the Site or Site filling. Only nickel was detected above the UUSCOs in the samples collected in the native material from 20 to 22 feet bgs.

4. Groundwater Quality: Groundwater impacts identified at the Site consisted of concentrations of VOCs, SVOCs (primarily PAHs), PCBs, and metals in exceedance of the NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGV). Elevated concentrations of the VOC chloroform may be attributed to an unidentified off-Site source or historical dry-cleaning operations on adjoining properties, and elevated concentrations of the CVOC TCE may be attributed to historical surrounding dry-cleaning

operations or an unidentified off-Site source. Elevated concentrations of PAHs in groundwater may be attributed to the historical on-Site operations, including potential historical petroleum storage, the adjacent NYSDEC Spill Site at 1 Hanson Place (with confirmed groundwater impacts), or an unidentified off-Site source. Total PCBs were detected marginally in exceedance of the NYSDEC AWQSGVs at only two wells. It should be noted that as identified in the DUSR, PCBs were also detected in the method blanks associated with these samples and as such, the marginal exceedances above the AWQSGVs at these locations may be due to laboratory contamination. Total lead and total chromium were identified in groundwater at concentrations exceeding the AWQSGV; however, the corresponding dissolved lead and chromium results did not identify either of these compounds above the AWQSGV. As such, the presence of total lead and total chromium in groundwater above the AWQSGV are attributable to elevated turbidity during sampling. Other metals detected in groundwater above the AWQSGVs (total iron, total and dissolved manganese, and total and dissolved sodium) are attributed to naturally occurring background concentrations. The presence of PFAS compounds in groundwater may be attributable to historical and active surrounding dry-cleaning/laundry facilities or an unidentified off-Site source.

5. Soil Vapor Quality: Results of the soil vapor evaluation completed as part of the 2015 SI and 2021 RI identified concentrations of TCE that would require monitoring and/or mitigation per the NYSDOH Soil Vapor Intrusion Matrix guidance values. Although TCE was not detected at concentrations exceeding NYSDEC SCOs in soil samples collected across the Site and was not detected exceeding NYSDEC AWQSGV in groundwater at the monitoring well collocated with the impacted samples LSV-7A/B (LMW-4), TCE was detected in one nearby monitoring well (MW-11), also in the eastern portion of the Site, at a concentration exceeding the AWQSGV. The presence of TCE in groundwater and soil vapor is attributed to either historic surrounding dry-cleaning facilities or an unknown off-Site source. Elevated concentrations of petroleum-related VOCs including BTEX compounds, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were detected at all sample locations throughout the Site footprint and are attributable to historical Site operations such as a garage/gasoline station and the potential former use of USTs, historic adjacent or surrounding site operations and/or petroleum releases, or an unknown off-Site source. Elevated concentrations of the VOC 2-Butanone were also detected at all sample locations throughout the Site footprint and may be attributable to an unknown off-Site source.

Qualitative Human Health Exposure Assessment

Based on the conceptual Site model (CSM) and review of environmental data, complete on-Site exposure pathways appear to be present in the absence of protective measures and remediation. The complete pathways indicate there is a risk of exposure to humans from Site contaminants via exposure to soil, groundwater, and soil vapor for current and during construction conditions unless certain Site access restrictions, which have already been put in place, are implemented.

1. Under current conditions, there is a marginal risk for exposure unless health and safety measures are implemented. The primary exposure pathways are for dermal contact, ingestion and inhalation of soil (dust) or soil vapor by authorized Site personnel in instances where the integrity of the impermeable Site cover is compromised or during Site investigation. This is a low risk since the Site is paved. Exposure to groundwater (due to depth) is limited to those completing investigation activities. The exposure risks can be avoided or minimized by limiting Site access and implementing the appropriate health and safety and vapor and dust suppression measures outlined in a Site-specific HASP and CAMP during ground-intrusive activities.
2. In the absence of protective measures, there is a moderate risk of exposure during the construction and remediation activities. The primary exposure pathways are:
    a. Dermal contact, ingestion and inhalation of contaminated soil, groundwater, or soil vapor by Site visitors and construction and remediation workers.
    b. Dermal contact, ingestion and inhalation of soil (dust) and inhalation of soil vapor by the community in the vicinity of the Site.

    These exposure pathways can be avoided or minimized by performing community air monitoring and by following the appropriate health and safety plans, implementing vapor and dust suppression techniques, and using Site security to control access.
3. A complete exposure pathway is possible for the migration of Site contaminants in the form of dust to off-Site human receptors during the remedial construction phase. During this phase, Site access will be limited to authorized personnel and workers and protective measures will be used during construction to prevent completion of this pathway, including following a Site-specific HASP and implementation of a CAMP.
4. The existence of a complete exposure pathway for Site contaminants to human receptors during proposed future conditions is unlikely, as on-Site sources of contamination will be excavated and transported for off-Site disposal and any remaining residual contamination will be addressed via the implementation of

engineering and institutional controls as part of the remedial action. Regional groundwater is not used as a potable water source in this part of New York City. The potential pathway for soil vapor intrusion into the buildings, likely a result of migration of CVOCs from an off-Site source, will be minimized for occupied portions of the building basement and the at grade portion of the first floor on the western portion of the Site by at a minimum the foundation slabs, walls and a vapor barrier.

Summary of the Remedy

It is anticipated that the Site will be remediated to meet the preferred Track 2/Track 4 RRSCOs. The selected remedy will include the following elements:

- Green and Sustainable Remediation: The major green remediation components are as follows:
    - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
    - Reducing direct and indirect greenhouse gases and other emissions;
    - Increasing energy efficiency and minimizing use of non-renewable energy;
    - Conserving and efficiently managing resources and materials;
    - Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
    - Maximizing habitat value and creating habitat when possible;
    - Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
    - Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
    - Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

  As part of the remedial program, to evaluate the remedy with respect to green and sustainable remediation principles, a SiteWise™ environmental footprint analysis has been completed. Water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use for the remedy have been

estimated, and goals for the project related to these green and sustainable remediation metrics, and for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial program, as appropriate. The project will include detailed requirements to achieve the green and sustainable remediation goals. Further, progress with respect to green and sustainable remediation metrics that have been established by the SiteWise™ model will be tracked during implementation of the remedial action and reported in the Final Engineering Report (FER), including a comparison to the goals established during the remedial program.

- Development and implementation of a CHASP and CAMP for the protection of on-Site workers, community/residents, and the environment during remediation and construction activities.
- Construction of the support of excavation (SOE) system to a depth range of 7 to 10.5 feet bgs to facilitate the Track 2 remedial excavation.
- Excavation, stockpiling, off-Site transport, and disposal of all soil that exceeds the Track 2 RRSCOs as defined by 6 NYCRR Part 375-6.8(b) to el 39 NAVD88 (corresponding to between 7 and 10.5 feet bgs) across approximately 84% of the Site footprint within the Track 2 portion of the Site based on the 2015 SI and 2021 RI data and to el 43 NAVD88 (corresponding to 2 feet bgs) across the remaining 16% of the Site footprint for construction of a loading dock and building foundation elements within the Track 4 portion of the Site.
- Collection and analysis of: confirmation soil samples from the Track 2 portion of the Site at the remedial elevation of el 39 NAVD88 (between 7 and 10.5 feet bgs), in accordance with DER-10 to confirm if the Track 2 RRSCOs were achieved; documentation soil samples in the Track 2 portion of the Site where overall construction excavation depths are greater than 15 feet bgs and the Track 2 RRSCOs were not achieved in order to document any remaining exceedances that may be present below this depth; and documentation soil samples in the Track 4 portion of the Site to document soil quality remaining at the Site. If the results of the confirmation soil samples identify Track 2 RRSCO exceedances, additional samples will be taken in two-foot intervals down to the planned depth of soil excavation or 15 feet bgs to determine the depth at which Track 2 SCOs can be achieved.

- Importation and backfilling of remediated areas and placement of additional fill as necessary to raise the remedial excavations areas to development grade with material meeting the RRSCOs, recycled concrete aggregate (RCA), or virgin, native crushed stone in compliance with 6 NYCRR 375-6.7(d). A NYSDEC Request to Import/Reuse Fill or Soil form (Revised April 2023; provided in Appendix C) will be submitted to NYSDEC in advance of any proposed import and backfill.
- Reuse of Site soil meeting the RRSCOs to backfill the excavation and/or establish design grades at the Site, as needed in compliance with NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10. A NYSDEC Request to Import/Reuse Fill or Soil form (Revised April 2023; provided in Appendix C) will be submitted to NYSDEC in advance of any proposed reuse action.
- As part of the Track 4 portion of the remedy, installation of a site cover system, including the concrete-paved loading dock to prevent human exposure to remaining contaminated soil/fill.
- Completion of a survey to document the extents of the Track 2 remediation, the Track 4 remediation, and the Site cover system.
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site and prohibitions on sensitive Site uses, such as farming or vegetable gardening, to eliminate future exposure pathways.

Recording of an Environmental Easement (EE) to memorialize the remedial action and the engineering and institutional controls to ensure that future owners of the Site continue to maintain these controls as required.

- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of remaining contamination as required by the EE, including plans for: (1) engineering and institutional controls, (2) monitoring, (3) operation and maintenance, and (4) reporting.
- A provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the Site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion.

The preferred Combined Track 2 and Track 4 remedial action has been selected based on the results of the Remedial Investigation completed for the Site. Remedial activities will be performed in accordance with this RAWP, and the Department-issued Decision Document.

Deviations from the RAWP and/or Decision Document will be promptly reported to the NYSDEC for approval and explained in the Final Engineering Report (FER).

1.0 INTRODUCTION

130 Saint Felix Street LLC (the Volunteer/Owner) entered into a Brownfield Cleanup Agreement (BCA) Index No. C224306-05-20 in July 2020 to investigate and remediate a 0.273-acre property located at 130 Saint Felix Street in Brooklyn, NY. The BCA was amended on 17 December 2022 to slightly modify the Site boundary from 0.288 acres down to 0.273 acres and to document that the Site is eligible for tangible property tax credits since the proposed development will be a 30% Mandatory Inclusionary affordable for sale condominium housing project. The Site is identified in the BCP as Site No. C224306. When completed, the Site will contain a mixed-use 30% Mandatory Inclusionary affordable for sale condominium housing and commercial building with a loading dock on the western portion of the Site.

This RAWP summarizes the nature and extent of contamination as determined from data gathered during the Subsurface Investigation (SI) work completed by Langan in 2015 and documented in a June 2015 SI Report and the Remedial Investigation (RI) completed by Langan in 2021 and documented in the February 2022 Remedial Investigation Report (2022 RIR). The selected remedy is consistent with the procedures defined in DER-10/Technical Guidance for Site Investigation and Remediation and complies with applicable standards, criteria, and guidance, and with applicable federal, state and local laws, regulations and requirements.

1.1 Site Location and Description

The Site is located in the Fort Greene neighborhood of Brooklyn, New York and is identified as a portion of Block 2111 Lot 40. The Site is an approximately 0.273 acres (11,895-square-foot) parcel and is currently an at-grade asphalt paved parking lot that has been used as such since at least 1950. An easement in the southwest corner of Lot 40 exists that provides the adjacent property (1 Hanson Place) access to its generator, which is also located on Lot 40. This generator easement area is excluded from the BCP Site. The BCP Site is subject to other easements providing 1 Hanson Place with access to the Site, including a loading area easement in the western portion of Lot 40. These easements will continue to exist after redevelopment of the Site but will not impact the remediation or post remediation Site Management Plan obligations. The Site is bound to the north by a four-story building occupied by the Brooklyn Music School and a seven-story building occupied by the Brooklyn Academy of Music; Saint Felix Street followed by five 2.75- to three-story residential buildings to the east; the 41-story mixed-use residential/commercial Williamsburg Savings Bank Tower (1 Hanson Place) and associated generator and a three-story church building to the south; and Ashland Place followed by a 31-story mixed-use residential/commercial building to the west. The Site is located within a commercial

zoning district (C6-4) and is designated for garage/gas station use (G6) by the New York City Department of Finance.

According to the New York City Department of City Planning zoning map dated 16 June 2022, the Site is located within the Special Downtown Brooklyn District. The Special Downtown Brooklyn District was created to establish special height and setback regulations and urban design guidelines to promote and support the continued growth of Downtown Brooklyn as a unique mixed-use area.

The Volunteer applied for a zoning map amendment to change from a C6-1 district to a C6-6 district on the western portion of the Site and from a C6-1 district to a C6-4 district on the eastern portion of the Site to allow for a mixed-use residential/institutional building. This zoning map amendment received a Negative Declaration and Statement of No Significant Effect on 3 May 2021. As part of the City Environmental Quality Review (CEQR) rezoning process, an E-designation was placed on Block 2111, Lot 40 for air quality, window wall attenuation and alternate ventilation, and hazardous materials.

A Site location map and Site Plan are provided as Figures 1 and 2, respectively. A Site survey is provided as Appendix A.

Based on a March 2021 survey prepared by True North Surveyors, Inc., existing site grade ranges from about el 43.9 to el 49.32 North American Vertical Datum of 1988 (NAVD88).

1.2 Redevelopment Plan

The Site is proposed to be developed with a 167,000 gross square foot, mixed-use for sale condominium with a 30% affordable housing component building on top of a 20,000 gross square foot community facility space to be purchased and occupied by the Brooklyn Music School. The proposed building will contain a partial cellar on the eastern portion of the Site. Based on the most recent proposed plans, the cellar and first floor will occupy approximately 9,480-square-feet and 10,100-square-feet, respectively, of the approximately 11,890-square-foot property. The planned redevelopment excavation will extend down to approximately 16 feet bgs in the portion of the Site that will contain the new basement. The remainder of the Site will be occupied by a concrete-paved loading dock along Ashland Place. The proposed development plans are included as Appendix B.

1.3 Description of Surrounding Property

According to records maintained online by New York City Open Accessible Space Information System (NYCOASIS) and aerial/street-view observations provided by Google Maps, surrounding properties include two Brooklyn Academy of Music buildings, five residential buildings, a 41-story mixed-use residential/commercial building and associated generator, a three-story church building, and a 31-story mixed-use residential/ commercial building. The adjacent property and surrounding site uses are depicted on Figure 3. The following is a summary of surrounding property use:

Direction	Adjacent Properties			Surrounding Properties
	Block No.	Lot No.	Description	
North	2111	11	BAM Fisher Performing Arts Theatre (321 Ashland Place)	Brooklyn Academy of Music Performing Arts Theatre, Ashland Place followed by a residential/commercial building, and Saint Felix Street followed by a school and residential buildings
		37	Brooklyn Music School (126 Saint Felix Street)	
East	2112	9	Residential Building (131 Saint Felix Street)	Residential Buildings
		10	Residential Building (129 Saint Felix Street)	
		11	Residential Building (127 Saint Felix Street)	
		12	Residential Building (125 Saint Felix Street)	
		13	Residential Building (123 Saint Felix Street)	
South	2111	7501	Williamsburg Savings Bank Tower Mixed-Use Residential/Commercia l Building (1 Hanson Place)	Hanson Place followed by Long Island Rail Road Atlantic Terminal and a commercial building, Ashland Place followed by a residential/commercial building, and Saint Felix Street followed by residential buildings
		45	Hanson Place Central United Methodist Church (144 Saint Felix Street)	

Direction	Adjacent Properties			Surrounding Properties
	Block No.	Lot No.	Description	
West	2110	3	Mixed-use Residential/ Commercial Building (286 Ashland Place)	Flatbush Avenue followed by commercial/office buildings and an industrial/manufacturing building

Public infrastructure (storm drains, sewers, and underground utility lines) exists within the street to the east and west of the Site. New York City Transit (NYCT) subway tunnels are located beneath Lafayette Avenue to the north, Saint Felix Street to the east, and Ashland Place, Fourth Avenue, and Flatbush Avenue to the west and south of the Site. Sensitive receptors (as defined in DER-10) located within a half mile of the Site include:

Number	Name (Approximate distance from site)	Address
1	Hanson Place Elementary School (approximately 200 feet northeast of the Site)	38 Lafayette Avenue Brooklyn, NY 11217
2	Hanson Place Child Development Center, Inc. (approximately 500 feet east of the Site)	55 Hanson Place Brooklyn, NY 11217
3	Metropolitan Corp. Academy (approximately 800 feet northwest of the Site)	362 Schermerhorn Street Brooklyn, NY 11217
4	Pacific Library (approximately 900 feet south of the Site)	25 Fourth Avenue Brooklyn, NY 11217
5	Brooklyn High School For The Arts (approximately 1,000 feet southwest of the Site)	345 Dean Street Brooklyn, NY 11217
6	Acorn High School For Social Justice (approximately 1,100 feet southwest of the Site)	500 Pacific Street Brooklyn, NY 11217
7	Brooklyn Technical High School (approximately 1,200 feet north of the Site)	29 Fort Greene Place Brooklyn, NY 11217
8	Northside Center for Child Development, Inc. (approximately 1,200 feet northwest of the Site)	44-60 Rockwell Place Brooklyn, NY 11217
9	Hanover Place Child Care, LLC/Milestone School For Child Development, (approximately 1,500 feet northwest of the Site)	15 Hanover Place Brooklyn, NY 11201
10	P369K: The Coy L. Cox School (approximately 1,500 feet northwest of the Site)	383 State Street Brooklyn, NY 11217

Number	Name (Approximate distance from site)	Address
11	School for the Science Language & Art International School (approximately 1,500 feet northwest of the Site)	9 Hanover Place Brooklyn, NY 11201
12	Public School 038 The Pacific/Virtual Y – YMCA of Greater NY (approximately 1,500 feet southwest of the Site)	450 Pacific Street Brooklyn, NY 11217
13	Raices Gowanus Senior Center/Strong Place for Hope Day Care Center and Pre-K (approximately 1,600 feet west of the Site)	460 Atlantic Avenue Brooklyn, NY 11217
14	Kids Run Around Daycare (approximately 1,700 feet southwest of the Site)	615 Warren Street Brooklyn, NY 11217
15	The Brooklyn Hospital Center – Downtown Campus (approximately 1,800 feet north of the Site)	121 Dekalb Avenue Brooklyn, NY 11217
16	Junior High School/Old 294 Edmonds Center/Long Island University After School Program (approximately 1,900 feet northeast of the Site)	300 Adelphi Street Brooklyn, NY 11205
17	Wyckoff Gardens Neighborhood Senior Center/Community Center After School Program/ Wyckoff Homes Adult and Continuing Education (approximately 2,000 feet southwest of the Site)	280 Wyckoff Street Brooklyn, NY 11217
18	PAL/World of Little People Head Start (approximately 2,100 feet southwest of the Site)	565 Baltic Street Brooklyn, NY 11217
19	Park Slope Christian Academy (approximately 2,100 feet south of the Site)	98 5th Avenue Brooklyn, NY 11217
20	Luria Academy Day Care Center (approximately 2,100 feet southeast of the Site)	535 Dean Street Brooklyn, NY 11217
21	Atlantic Terminal Community Center After School Program (approximately 2,300 feet southeast of the Site)	501 Carlton Avenue Brooklyn, NY 11238
22	Public School 133 William A. Butler/OST – University Settlement Society of NY After School Program (approximately 2,300 feet southwest of the Site)	375 Butler Street Brooklyn, NY 11217
23	Long Island University- Brooklyn Campus/WIA In School Youth After School Program (approximately 2,400 feet northwest of the Site)	1 University Plaza Brooklyn, NY 11201

Number	Name (Approximate distance from site)	Address
24	Public School 020 Clinton Hill/YMCA of Greater NY After School Program (approximately 2,600 feet northeast of the Site)	225 Adelphi Street Brooklyn, NY 11205
25	Middle School 266 Park Place/21st Century – Benjamin Banneker Community Development Center After School Program (approximately 2,600 feet south of the Site)	64 Park Place Brooklyn, NY 11217
26	Eladia's Day Care Center (approximately 2,600 feet south of the Site)	266 Flatbush Avenue Brooklyn, NY 11217

1.4 Site History

1.4.1 Past Uses and Ownership

Previous environmental assessments and investigation reports prepared for the Site (listed in the subsequent section) and of available records maintained online by the New York City Department of Buildings (NYCDOB) identify that the Site was an at-grade asphalt-paved parking lot since at least 1950 and may have contained underground storage tanks (USTs) due to the Site's classification as a garage/gasoline station, which could have impacted soil, groundwater and/or soil vapor. Historical operations at adjacent and surrounding properties include drug manufacturing, dry-cleaning and laundry, automobile sales, and a gasoline filling station. Dry cleaning facilities were identified located hydraulically upgradient and between 500- and 900-feet of the Site at 696 Fulton Street, 711 Fulton Street, and 85 Lafayette Avenue. A hydraulically downgradient dry cleaning facility was identified 1,200-feet from the Site at 64 Fourth Avenue.

At the adjacent property to the south located at 1 Hanson Place, a tank failure resulted in a fuel oil release that was reported to NYSDEC in 2004 and was administratively closed in 2015.

The primary contaminants of concern identified as part of environmental investigations completed prior to the RI are SVOCs and metals commonly associated with petroleum impacts and contaminated fill. These contaminants were detected in soil at concentrations exceeding the applicable NYSDEC Restricted Residential RUSCOs. VOCs commonly associated with petroleum impacts have also been detected in soil at concentrations exceeding NYSDEC PGWSCOs. In groundwater, VOCs and metals have been detected at concentrations exceeding NYSDEC 6 NYCRR Part 703.5 Class GA Groundwater Quality Standards and Division of Water Technical and Operational Guidance Series 1.1.1 and Ambient Water Quality Guidance Values

adopted in the NYSDEC Sampling, Analysis, and Assessment of PFAS (April 2023) (collectively referred to as AWQSGVs) for Class GA water. Additionally, petroleum-related VOCs and low levels of chlorinated VOCs were detected in soil vapor.

1.4.2 Previous Environmental Reports

The following environmental assessment and investigation reports have been prepared for the Site, copies of which are available for review online through the DECinfo Locator: https://www.dec.ny.gov/data/DecDocs/C224306/..

- *Phase I Environmental Site Assessment*, prepared by Langan, dated May 2015
- *Subsurface Investigation Report*, prepared by Langan, dated June 2015
- *Geophysical Engineering Survey Report*, prepared by NOVA Geophysical Engineering (NOVA), dated 14 January 2020
- *BCP Application*, prepared by Knauf Shaw LLP, dated 4 February 2020
- *Brownfield Cleanup Agreement (BCA)*, dated 7 July 2020
- *RIWP*, prepared by Langan, dated 17 December 2020
- *RIR,* prepared by Langan, dated 4 February 2022
- *BCA Amendment Application*, prepared by Knauf Shaw LLP, dated 27 July 2022

Summaries of environmental findings of these reports are provided below.

1.4.2.1 Phase I Environmental Assessment – (Langan 2015)

Langan conducted a Phase I Environmental Site Assessment (ESA) dated May 2015 for the Site. At the time of the assessment, the Site was operated as a parking lot.

The ESA identified the following recognized environmental concerns (RECs):

- Historical Site use due to the City's Department of Finance classification of the Site as a garage/gasoline station, and the potential for historical automobile repair or service activities. During Site reconnaissance concrete patches and patched asphalt were observed, which were inferred to potentially be due to the presence of historic USTs;
- Historical use of adjacent and surrounding properties, including drug manufacturing, dry-cleaning and laundry, automobile sales, and a gasoline filling station. In addition, the property adjacent to the south at 1 Hanson Place is associated with closed Spill No. 0402131, which was reported to NYSDEC in 2004 for a release of an unknown quantity of No. 2 fuel oil as the result of a tank failure. Fuel oil impacts were observed in soil from approximately 4 to 40 feet bgs. Petroleum free phase product was observed on

groundwater, which was measured at approximately 43 feet bgs. A work plan for delineation and an exposure assessment was submitted to the NYSDEC in November 2013. The spill was administratively closed by NYSDEC on 15 April 2015; however, closure documentation was not available for review to determine if impacts had migrated off-site. No records identifying completion of an off-Site investigation were identified, however an assessment of impacts associated with this spill was completed as part of the RI.

Langan recommended a subsurface investigation on the Site as a result of the above identified RECs.

1.4.2.2 Subsurface Investigation Report – Langan (2015)

Langan conducted a SI for the Site in May 2015 to address the RECs identified in the Phase I ESA. The investigation included installation of five soil borings, one flush-mount groundwater monitoring well, three soil vapor sampling points, and collection of soil, groundwater, and soil vapor samples. A detailed summary of this report is provided in the February 2022 RIR. The analytical results of this investigation are summarized in Tables 1A/B through 3 and sample locations and analytical results are shown on Figures 5A/B through 7. Additionally, the results of the 2015 SI are included in the discussion of the RI activities and results in Section 2.0 of this report.

1.4.2.3 Geophysical Engineering Report (NOVA 2020)

On 10 January 2020, a geophysical investigation was completed by NOVA throughout the entire site to investigate the potential presence of USTs related to the potential historic use of the Site as a garage/gasoline filling station and the observed concrete patches and patched asphalt indicative of UST removal, which were identified as a REC during Langan's 2015 Phase I ESA.

The geophysical survey identified anomalies resembling potential subsurface utilities such as drainage pipes or conduits within the western portion of the Site. A suspected fill port and associated piping was identified within the sidewalk adjacent to the Site and entering the Site along Saint Felix Street. Besides piping below the sidewalk associated with the potential fill port, subsurface metallic anomalies were not identified during the geophysical survey and the presence of a UST was not confirmed.

1.4.2.4 BCP Application and BCA (2020)

The Volunteer submitted a BCP Application to NYSDEC for the Site on 4 February 2020 and the BCA was executed on 7 July 2020.

1.4.2.5 Remedial Investigation Work Plan – Langan (2020)

An RIWP dated 12 December 2020 was prepared by Langan for 130 St. Felix Street LLC. The RIWP was prepared to investigate and characterize "the nature and extent of the contamination at and/or emanating from the brownfield site" per ECL Article 27-1415(2) (Brownfield Cleanup Program), to supplement the investigation activities and results documented in the 2015 SI Report, to evaluate potential exposure via soil vapor intrusion across the entire Site, and to determine on- and off-site receptors as part of the Qualitative Human Health Exposure Assessment as required by the 20 October 2020 NYSDOH Draft RIWP comment letter and NYSDEC comments for the Draft RIWP submitted on 7 August 2020. These requirements were subsequently addressed in the revised RIWP dated 12 December 2020 prepared by Langan and approved by the NYSDEC on 5 January 2021.

1.4.2.6 Remedial Investigation Report – Langan (2022)

A draft Remedial Investigation Report dated 30 August 2021 was prepared by Langan for 130 St. Felix Street LLC. The RIR documented the RI completed in accordance with the RIWP. A final RIR dated 4 February 2022 was prepared by Langan and approved by the NYSDEC on 20 May 2022. The results of the 2021 RI are included in the discussion of the RI activities and results in Section 2.0 of this report.

1.4.2.7 BCA Amendment Application (2022)

The Volunteer submitted a BCA Amendment Application to NYSDEC for the Site on 27 July 2022. The application was submitted to both provide the required proof that the Site will be developed into an affordable housing project and to decrease the size of the Site. At the time of the BCP Application in 2020, the Volunteer intended to move the generators associated with the adjacent 1 Hanson Place building located within and subject to a generator easement. However, due to the extensive cost and disruption that would be associated with moving the generators, the Volunteer elected not to move the generators and to exclude this 0.015 acre area from the BCP Site. Therefore, the final acreage for the BCP Site is 0.273. The BCA Amendment was executed on 16 December 2022. The Volunteer was deemed also eligible for the tangible

property tax credits as a result of the proof provided with respect to the planned affordable housing project in this BCA Amendment.

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The RI was completed in accordance with the Remedial Investigation Work Plan (RIWP) approved by the NYSDEC on 5 January 2021, and Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375-1, 3.8, 6.8, NYSDEC Division of Environmental Remediation (DER) Program Policy: Technical Guidance for Site Investigation and Remediation (DER-10), and the New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006, with updates. The RI field work was completed to determine the nature and extent of contamination in soil. The February 2022 RIR summarizes the RI work completed to characterize the nature and extent of contamination at the Site.

The findings of the SI and RI are summarized in the following sections.

2.1 Field Investigation

The investigation completed during the 2015 SI consisted of the following:

- Completion of five soil borings and collection of six soil samples (including one duplicate sample) to assess soil conditions;
- Installation and sampling of one monitoring well in order to collect a groundwater sample (including one duplicate sample) to assess Site groundwater conditions; and
- Installation and sampling of three soil vapor points in order to assess Site soil vapor conditions.

The investigation completed during the RI consisted of the following:

- A limited geophysical survey in the vicinity of soil boring locations to clear potential utilities in the vicinity of test pits and soil boring locations;
- Advancement of seven soil borings (LSB-1 through LSB-7) and collection of 23 soil samples (including two duplicate samples);
- Completion of 7 test pits at three locations suspected to be associated with former or potentially closed in-place UST locations, where asphalt patching was observed within the existing parking lot and at the location where a suspected fill line beneath the St. Felix Street sidewalk enters the Site;
- Installation of five permanent monitoring wells (LMW-1 through LMW-5) and collection of 7 groundwater samples (including one duplicate sample);

- Survey and gauging of monitoring wells to evaluate groundwater elevation and flow direction; and
- Installation of 15 soil vapor sampling points (LSV-1, LSV-2A through LSV-8A, and LSV-2Bthrough LSV-8) and collection of 16 soil vapor samples (including one duplicate sample) and one ambient air sample.

2.1.1 Summary of Remedial Investigation Findings

The findings summarized herein are based on field observations and instrumental readings and laboratory analytical results of soil, groundwater, and soil vapor samples collected during the 2015 SI and 2021 RI. Analytical results of soil samples collected during the 2015 SI and 2021 RI were compared to the 6 NYCRR NYSDEC Part 375 UUSCOs, PGWSCOs and RRSCOs. Groundwater sample results were compared to the AWQSGVs. Soil vapor sample results were evaluated using the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in New York State Soil Vapor/Indoor Air Decision Matrices dated October 2006 and updated May 2017. Cross-sectional diagrams showing inferred soil profiles are included as Figures 4A and 4B. Soil sample results are summarized on Figures 5A and 5B, groundwater sample results are summarized on Figure 6, and soil vapor results are summarized on Figure 7. Findings and conclusions are as follows:

1. Stratigraphy: A contaminated non-native soil layer as deep as 13 feet is generally underlain by a native sand layer that was consistently encountered until boring termination depth across the site. Gravel layers, within the native sands, ranging in thickness from approximately 1 to 5 feet were also identified between approximately 26.5 and 40 feet bgs within two soil borings advanced in the eastern portion of the Site. Bedrock was not encountered in any of the soil borings advanced during the 2015 SI or the 2021 RI.

2. Hydrogeology: Groundwater was encountered between el 2.25 to 2.85 NAVD88, corresponding to 38.79 and 41.98 feet bgs, during the RI. Based on observed groundwater elevations, groundwater has been determined to flow to the south/ southwest towards the Gowanus Canal.

3. Soil Quality: Up to 13 feet of contaminated non-native material was identified below surface cover. Odors were observed in soil between 7 and 8 feet bgs in one location in the northeast portion of the Site. No elevated PID readings or visual or olfactory evidence of impacts were observed in any of the remaining soil borings or test pits. Contaminants identified within this material include VOCs, SVOCs, metals, and pesticides, which were detected at concentrations above UUSCOs, RRSCOs, and/or PGWSCOs. Contaminants identified in soil samples collected from directly beneath the contaminated material/

native material interface and within the native material at the two-foot interval below the proposed redevelopment depth (i.e., 20 to 22 feet bgs) include metals detected at concentrations above the UUSCOs, only. Contaminants at concentrations above UUSCOs, RRSCOs, or PGWSCOs were not identified in deep native soil samples collected from the two-foot interval above the observed groundwater interface (i.e., either 40 to 42 feet bgs or 42 to 44 feet bgs). Elevated concentrations of PAHs, metals, and pesticides in near-surface contaminated material (including contaminated non-native material and native material directly beneath the contaminated non-native/native material interface) are attributable to historic site operations or Site filling. Only nickel was detected above the UUSCOs in the samples collected deeper in the native material from 20 to 22 feet bgs.

4. Groundwater Quality: Groundwater impacts identified at the Site consisted of concentrations of VOCs, SVOCs (primarily PAHs), PCBs, and metals in exceedance of the NYSDEC AWQSGVs. Elevated concentrations of the VOC chloroform may be attributed to an unidentified off-Site source and elevated concentrations of the CVOC TCE may be attributed to historical surrounding dry-cleaning operations or an unidentified off-Site source. Elevated concentrations of PAHs in groundwater may be attributed to the historical on-Site operations, including potential historical petroleum storage (though the presence of historical petroleum USTs was not confirmed during the remedial investigation), the adjacent NYSDEC Spill Site at 1 Hanson Place (with confirmed groundwater impacts), or an unidentified off-Site source. Total PCBs were detected marginally in exceedance of the NYSDEC AWQSGVs at only two wells. It should be noted that as identified in the DUSR, PCBs were also detected in the method blanks associated with these samples and as such, the marginal exceedances above the AWQSGVs at these locations may be due to laboratory contamination. While total lead and total chromium were identified in groundwater at concentrations exceeding the AWQSGV; the corresponding dissolved lead and chromium results did not identify either of these compounds above the AWQSGV. As such, the presence of total lead and total chromium in groundwater above the AWQSGV are attributable to elevated turbidity during sampling. Other metals detected in groundwater above the AWQSGVs (total iron, total and dissolved manganese, and total and dissolved sodium) are attributed to naturally occurring background concentrations. The presence of PFAS compounds in groundwater may be attributable to historical and active surrounding dry-cleaning/laundry facilities or an unidentified off-Site source.

5. Soil Vapor Quality: Results of the soil vapor evaluation completed as part of the 2015 SI and 2021 RI identified concentrations of TCE that would require monitoring and/or mitigation per the NYSDOH Soil Vapor Intrusion Matrix guidance values. Although TCE was not detected at concentrations exceeding NYSDEC SCOs in soil samples collected across the Site and was not detected exceeding NYSDEC AWQSGVs in groundwater at the monitoring well collocated with the impacted samples LSV-7A/B (LMW-4), TCE was detected in one nearby monitoring well (MW-11), also in the eastern portion of the Site, at a concentration exceeding the AWQSGV. The presence of TCE in groundwater and soil vapor is attributed to either historic surrounding dry-cleaning facilities or an unknown off-Site source. Elevated concentrations of petroleum-related VOCs including BTEX compounds, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were detected at all sample locations throughout the Site footprint and are attributable to historical Site operations as a garage/gasoline station and the potential former use of USTs, historic adjacent or surrounding site operations and/or petroleum releases, or an unknown off-Site source. Elevated concentrations of the VOC 2-Butanone were also detected at all sample locations throughout the Site footprint and may be attributable to an unknown off-Site source.

2.2 Geological Conditions

Provided below is a description of the geologic and hydrogeologic observations made during the 2015 SI and the 2021 RI. Subsurface profiles are included as Figures 4A and 4B. Soil boring logs, a groundwater contour map, and groundwater monitoring well construction logs were included in the February 2022 RIR.

2.2.1 Contaminated Non-Native Material

Contaminated non-native material was encountered during the investigations in all borings to depths ranging from 5 and 13 feet bgs. The non-native material generally consists of fine to coarse sand with varying proportions of silt, gravel, and clay and miscellaneous debris, including brick, wood, concrete, tile, glass, coal, and slag.

2.2.2 Native Soil Layers

The contaminated non-native material layer is underlain by native sands with trace clay, silt and/or gravel up to the RI boring termination depth of 50 feet bgs. Bedrock was not encountered during the environmental investigations.

2.2.3 Hydrogeology

Groundwater monitoring wells installed during the RI revealed groundwater at 39.5 to 43.20 feet bgs (corresponding to el 2.25 to 2.85 feet NAVD88). Based on groundwater elevation data collected as part of the RI, groundwater has been determined to flow to the south/southwest towards the Gowanus Canal. Groundwater in this part of New York City is not used as a potable (drinking) water source. The potable water supply is provided to the Site by the City of New York and is derived from surface impoundments in the Croton, Catskill, and Delaware watersheds.

Langan reviewed United States Fish and Wildlife National Wetland Inventory (NWI) and New York State Freshwater Wetlands maps. Based on these documents, no mapped wetlands are listed on the subject property.

2.3 Contaminant Conditions

2.3.1 Conceptual Site Model

A conceptual Site model (CSM) was developed based on the findings of the 2015 SI and the 2021 RI to produce a simplified framework for understanding the distribution of impacted materials, potential migration pathways, and potentially complete exposure pathways.

2.3.1.1 Potential Sources of Contamination

Potential sources of contamination have been identified and include historical site operations (including the potential historical use of USTs), historical adjacent and surrounding operations, and contaminated non-native material of unknown origin. Historical on-Site use as a garage/ gasoline station is a potential source of VOCs in soil and soil vapor and SVOCs in soil and groundwater. Historical adjacent and surrounding uses including drug manufacturing, dry-cleaning and laundry, automobile sales, and a gasoline filling station as well as unknown off-Site sources may also be contributing to the impacts of VOCs in groundwater and soil vapor and SVOCs, metals, and PFAS in groundwater. The Site-wide presence of contaminated material of unknown origin has also been established as a source of SVOCs, pesticides, metals, and PFAS in soil. Only nickel was detected above the UUSCOs in the samples collected in the native material from 20 to 22 feet bgs. The detection of CVOCs, specifically TCE, in groundwater and soil vapor may be attributable to historic and current surrounding dry-cleaning facilities or an unknown off-Site source. Detections of metals in groundwater are likely attributable to naturally occurring background concentrations, with the exception of lead and chromium. However, the corresponding dissolved lead and chromium results at these locations were non-detect or were

detected below the AWQSGV. Additionally, at the well location with total lead exceedances, the soil sample collected from immediately above the water table did not reveal the presence of lead above the PGWSCOs.

2.3.1.2 Exposure Media

Impacted media include soil, groundwater, and soil vapor. Analytical data indicates that soil contains VOCs, SVOCs, pesticides, and metals at concentrations greater than the UUSCOs, RRSCOs, and/or the PGWSCOs and PFAS above the NYSDEC UU and/or PGW Guidance Values. Groundwater contains VOCs, SVOCs, PCBs, metals, and PFAS above the AWQSGVs. Soil vapor at the Site is impacted with petroleum-related VOCs (BTEX and other compounds), 2-Butanone, and the CVOC TCE which was detected at concentrations above the NYSDOH guidance levels which would trigger monitoring and/or mitigation if detected as part of a soil vapor intrusion evaluation or applicable MCLs.

2.3.1.3 Receptor Populations

The Site is currently used as an asphalt-paved parking lot. The Site is enclosed in fencing and access is restricted to personnel completing Site investigations and other authorized guests. During Site development and remediation, human receptors will be limited to construction and remediation workers, authorized guests, design team members visiting the Site, and the public adjacent to the Site. Under future conditions, receptors will include the new building tenants, visitors to the building, and building management/maintenance employees.

2.3.2 Description of Areas of Concern

Laboratory analytical results for soil samples were compared to the 6 NYCRR Subpart 375-6.8(a-b) Remedial Program Soil Cleanup Objectives for Unrestricted Use, Restricted Residential Restricted Use, and Protection of Groundwater. Groundwater analytical results were compared to AWQSGV. Soil vapor was compared to NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion Matrices A through C dated October 2006 and revised in May 2017. Soil, groundwater, and soil vapor laboratory analytical results are summarized in Tables 1 through 3, and Figures 5 through 7.

This section discusses the results of the 2015 SI and the 2021 RI with respect to the Areas of Concern (AOCs) identified.

2.3.2.1 AOC-1: Historical Site Operations and Potential Historical Presence of USTs

Historical records indicate that past Site operations may have included a gasoline station or automotive repair or service operations. Additionally, on-Site concrete patches and patched asphalt observed during Langan's 2015 site reconnaissance and a UST fill port with piping leading into the Site detected during NOVA's 2020 geophysical survey indicate the potential presence or previous removal of on-site UST(s). However, as discussed above, neither prior geophysical investigations nor the test pit investigation completed as part of the RI were able to confirm the presence of USTs at these locations.

AOC-1 Findings Summary

Soil

In order to investigate soil in the vicinity of the suspected UST locations and/or to further characterize the impacts associated with historical Site operations identified in 2015, two soil borings (EB09 and EB12) were advanced at the Site in 2015 and four soil borings (LSB-2, LSB-3, LSB-4, and LSB-6) were advanced at the Site in 2021. A summary of the soil analytical results for AOC-1 is summarized as follows:

- Odors were observed in soil between 7 and 8 feet bgs in EB12. No elevated PID readings or visual or olfactory evidence of impacts were observed in any of the remaining soil borings or test pits.
- The VOCs naphthalene and total xylenes were detected above the UUSCOs and/or PGWSCOs in one sample collected from soil boring EB12 collected from 7 to 9 feet bgs in the contaminated non-native material layer within AOC-1. No VOCs were detected above the RRSCOs in this AOC.
- A soil sample was collected from 8 to 10 feet bgs in LSB-4. This sample both assessed native soil conditions directly beneath the contaminated non-native material/native material interface and also delineated the elevated concentrations of the VOCs naphthalene and total xylenes previously identified in EB12. No elevated PID readings or visual or olfactory evidence of impacts were observed and no VOCs were detected above the UUSCOs, PGWSCOs, or RRSCOs in LSB-4.
- 18 SVOCs (3 & 4 methylphenol, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, phenol, and pyrene) were detected above the UUSCOs, RRSCOs, and/or PGWSCOs in four samples collected from EB09, EB12, LSB-4, and LSB-6 at depths ranging from 0 to 9 feet bgs in AOC-1.

- Six metals, including barium, trivalent chromium, copper, lead, mercury, and zinc, were detected above the UUSCOs and/or PGWSCOs in 9 samples collected from EB09, EB12, LSB-2, LSB-3, LSB-4, and LSB-6 at depths ranging from 0 to 22 feet bgs in AOC-1. Three metals, including barium, lead and mercury, were detected above RRSCOs in 3 samples collected from EB09, EB12, and LSB-4 at depths ranging from 0 to 9 feet bgs in AOC-1.
- The pesticide 4,4'-DDT was detected above the UUSCOs in 1 sample collected from LSB-4 from 0 to 2 feet bgs in AOC-1. No pesticides were detected above PGWSCOs or RRSCOs in this AOC.
- PCBs were not detected above UUSCOs, PGWSCOs, or RRSCOs in this AOC.
- Herbicides were not detected above the UUSCOs, PGWSCOs, or RRSCOs in this AOC.
- PFAS compounds were not detected above the UU, RR, or PGW Guidance Values in this AOC.

Groundwater

In order to further investigate potential impacts to the Site from historical Site operations and potential historical presence of USTs, two groundwater samples were collected from two monitoring wells installed during the RI (LMW-2 and LMW-4). A summary of the groundwater analytical results for AOC-1 is summarized as follows:

- The VOC chloroform was detected above the AWQSGVs in both wells sampled for this AOC. It should be noted that chloroform was also detected above the AWQSGVs in all wells sampled across the Site.
- The SVOCs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene were detected above the AWQSGVs in LMW-4 and bis(2-ethylhexyl)phthalate was detected above the AWQSGVs in LMW-2.
- Two total and two dissolved metals, including manganese and sodium, were detected above the AWQSGVs in LMW-2 and only total and dissolved sodium were detected above the AWQSGVs in LMW-4.
- Pesticides, herbicides, and PCBs were not detected above the AWQSGVs in any groundwater samples collected in AOC-1.
- PFAS compounds were detected and PFOA in particular was detected above the AWQSGVs in both groundwater samples collected within this AOC. It should be noted that PFOA was also detected above the AWQSGV in all wells sampled across the Site, and PFOS was detected in one well.

Soil Vapor

Two shallow soil vapor points (SV02 and SV03) were installed during the 2015 SI and four shallow and four deep soil vapor points (LSV-2A/B, LSV-4A/B, LSV-5A/B, and LSV-7A/B) were installed during the RI within or in the vicinity of AOC-1. A summary of the soil vapor analytical results for samples collected within the vicinity of AOC-1 is summarized as follows:

- TCE was detected above the monitoring and/or mitigation threshold if detected as part of a soil vapor intrusion evaluation of 6 µg/m^3 in both the shallow and deep samples collected at LSV-7.
- Petroleum-related VOCs including BTEX, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were detected in all ten soil vapor samples collected within this AOC.
- 2-Butanone was detected in all ten soil vapor samples collected within this AOC.

AOC-1 Conclusions

The geophysical surveys and a test pit investigation completed as part of the SI and RI did not confirm the presence of USTs within AOC-1; however, odors and elevated concentrations of the VOCs naphthalene and total xylenes were detected in soil above the UUSCOs and/or PGWSCOs in EB12 in 2015. These impacts may be attributed to historical Site operations including a potential gasoline station or automotive repair or service operations and USTs. Vertical delineation of the impacts in EB12 were achieved via the installation and sampling of LSB-4 where no visual or olfactory evidence of impacts were observed and no VOCs were detected above the UUSCOs, PGWSCOs, or RRSCOs.

Elevated concentrations of PAHs above the UUSCOs, PGWSCOs, and/or RRSCOs in soil within AOC-1 may be attributed to historical Site operations including a potential gasoline station or automotive repair or service operations and USTs and/or the presence of contaminated material of unknown origin.

The VOC chloroform was detected in AOC-1 in groundwater above the NYSDEC AWQSGVs throughout the Site; however, this is likely not associated with historical Site uses or the presence of historic USTs as it was not detected or was only marginally detected above the reporting limit in the associated soil samples. The detections of PAHs above the NYSDEC AWQSGVs in AOC-1 may be attributed to the historical Site uses, including potential historical petroleum storage, the adjacent NYSDEC Spill Site at 1 Hanson Place, or another unidentified off-Site source. Detections of metals above the NYSDEC AWQSGVs in groundwater in AOC-1 are attributed to naturally occurring background concentrations. PFAS compounds detected above the AWQSGV in

groundwater in AOC-1 may be attributed to releases from the historical and active surrounding dry-cleaning/laundry facilities or an unidentified off-Site source and not the historical Site uses.

The detection of TCE in soil vapor in AOC-1 at LSV-7A/B at a concentration above the NYSDOH Soil Vapor Intrusion Matrix monitoring and/or mitigation threshold if detected as part of a soil vapor intrusion evaluation is likely attributable to historical surrounding dry-cleaners and not the historical Site uses. However, petroleum-related VOCs including BTEX compounds, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were detected in all 10 soil vapor samples collected in AOC-1 and may be attributable to historical Site operations including the potential former presence of USTs. 2-Butanone was also detected in all 10 soil vapor samples collected in AOC-1 and may be attributable to historical site operations.

2.3.2.2 AOC-2: Historical Adjacent and Surrounding Site Operations

Historical operations at adjacent and surrounding properties included drug manufacturing, dry-cleaning and laundry, automobile sales, and a gasoline filling station. The property adjacent to the south of the Site at 1 Hanson Place is associated with the release of an unknown quantity of No. 2 fuel oil as the result of a tank failure that was reported to NYSDEC in 2004 and assigned Spill No. 0402131. Fuel oil impacts were observed in soil from 4 to 40 feet bgs, and petroleum free phase product was observed on groundwater. A work plan for delineation and an exposure assessment was submitted to the NYSDEC in November 2013 and the spill was administratively closed in 2015.

AOC-2 Findings Summary

Soil

In order to further assess potential impacts to the Site from adjacent and surrounding sites, two soil borings (LSB-2 and LSB-7) were advanced in the vicinity of the adjacent NYSDEC Spill Site at 1 Hanson Place during the 2021 RI. A total of seven discrete soil samples including one duplicate sample were collected from these borings for laboratory analysis. A summary of the soil analytical results for AOC-2 is summarized as follows:

- No elevated PID readings or other petroleum-like impacts, including odors, LNAPL and/or sheen, were encountered in any soil borings.
- VOCs, SVOCs, pesticides, PCBs, and herbicides were not detected above the UUSCOs, PGWSCOs, or RRSCOs in this AOC.

- Two metals, including lead and mercury, were detected above the UUSCOs in two samples from borings LSB-2 and LSB-7 from 0 to 2 feet bgs; however, it is unlikely that these impacts are associated with the adjacent 1 Hanson Place release.
- PFOA was detected above the UU Guidance Values in one sample from LSB-7 from 8 to 10 feet bgs in this AOC. No PFAS compounds were detected above the RR or PGW Guidance Values in this AOC.

Groundwater

In order to further assess potential impacts to the Site from adjacent and surrounding sites, two groundwater samples were collected from two monitoring wells (LMW-2 and LMW-5) in the vicinity of the adjacent NYSDEC Spill Site at 1 Hanson Place. A summary of the groundwater analytical results for AOC-2 is summarized as follows:

- The VOC chloroform was detected above the AWQSGVs in both wells sampled for this AOC. It should be noted that chloroform was also detected above the AWQSGVs in all wells sampled across the Site.
- The SVOC bis(2-ethylhexyl)phthalate was detected above the AWQSGV in LMW-2.
- Total PCBs were detected above the AWQSGV in LMW-5.
- Pesticides and herbicides were not detected above the AWQSGVs in either groundwater sample collected in AOC-2.
- Two total and dissolved metals, including manganese and sodium, were detected above the AWQSGVs in both wells in AOC-2. Total iron was also detected above the AWQSGV in LMW-5.
- PFAS compounds were detected and PFOA in particular was detected above the AWQSGV in both groundwater samples collected within this AOC. It should be noted that PFOA was also detected above the AWQSGV in all wells sampled across the Site and PFOS was detected above the AWQSGV in one well.

Soil Vapor

Two shallow and two deep soil vapor points (LSV-2A/B and LSV-8A/B) were installed in the vicinity of the adjacent NYSDEC Spill Site at 1 Hanson Place. A summary of soil vapor analytical results are summarized below:

- NYSDOH Soil Vapor Intrusion Matrix compounds were not identified above the monitoring and/or mitigation thresholds if detected as part of a soil vapor intrusion evaluation in samples collected from this AOC.

- Petroleum-related VOCs including BTEX, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene were detected in all four soil vapor samples collected within this AOC.
- 2-Butanone was detected in all four soil vapor samples collected within this AOC.

AOC-2 Conclusions

Elevated concentrations of the metals lead and mercury above the UUSCOs are attributed to the presence of contaminated material of unknown origin. Similarly, PFAS compounds detected above the Guidance Values in soil in AOC-2 may be attributed to the presence of contaminated material of unknown origin.

The VOC chloroform, and the SVOC bis(2-ethylhexyl)phthalate were detected above the AWQSGVs in AOC-2. As both were not detected or were only marginally detected above the reporting limit in soil samples across the Site, these exceedance in groundwater may be attributed to the adjacent NYSDEC Spill Site at 1 Hanson Place or another unidentified off-Site source. Detections of metals above the AWQSGVs in groundwater in AOC-2 are attributed to naturally occurring background concentrations. PFAS compounds PFOA and PFOS detected above the AWQSGVs in groundwater for these two PFAS compounds in AOC-2 may be attributed to releases from the historical and active surrounding dry-cleaning/laundry facilities or an unidentified off-Site source.

NYSDOH Soil Vapor Intrusion Matrix compounds were not identified above the monitoring and/or mitigation thresholds (in samples collected from this AOC, however petroleum-related VOCs including BTEX compounds, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene were detected in all four soil vapor samples collected in AOC-2 and may be attributable to either historical Site operations or historic adjacent and surrounding operations including the adjacent NYSDEC Spill Site at 1 Hanson Place. Additionally, the detection of TCE in soil vapor in LSV-7A/B (included as part of the AOC-1 discussion in Section 2.3.2.1) above the NYSDOH Soil Vapor Intrusion Matrix monitoring and/or mitigation threshold if detected as part of a soil vapor intrusion evaluation is likely attributable to historical surrounding dry-cleaners. The VOC 2-Butanone was also detected in all four soil vapor samples collected in AOC-2 and may be attributable to an unknown offsite source.

2.3.2.3 AOC-3: Contaminated Non-Native Material of Unknown Origin

Soil borings advanced throughout the Site during Langan's 2015 SI and 2021 RI identified an up to 13 feet thick layer of contaminated non-native material in the central and eastern portions of the Site and an up to 9 foot thick layer in the western portion of the Site. PAHs and metals were

detected at concentrations exceeding the RRSCOs during the 2015 SI. As groundwater was generally encountered at depths ranging from approximately 39 to 42 feet bgs, at least 27 feet below the bottom of the contaminated material layer, groundwater analytical results are excluded from the evaluation of AOC 3.

AOC-3 Findings Summary

Soil

In order to characterize Site-wide contaminated non-native material, a total of four discrete soil samples were collected from within this layer and two discrete soil samples including one duplicate sample were collected directly beneath the contaminated non-native/native material interface for laboratory analysis during the 2015 SI. During the 2021 RI, eight discrete soil samples including one duplicate sample were collected within the contaminated non-native material layer and seven discrete soil samples were collected directly beneath this interface from seven borings for laboratory analysis. Soil analytical results collected at the Site for further characterization of AOC-3 are summarized as follows:

- Odors were observed in soil between 7 and 8 feet bgs in EB12. No elevated PID readings or visual or olfactory evidence of impacts were observed in any of the remaining soil borings.
- No PCBs or herbicides were detected above the UUSCOs, RRSCOs, or PGWSCOs.
- The VOCs naphthalene and total xylenes were detected above the UUSCOs and/or PGWSCOs in one sample collected from soil boring EB12 collected from 7 to 9 feet bgs in the contaminated non-native material layer. No VOCs were detected above the RRSCOs.
- A soil sample was collected from 8 to 10 feet bgs in LSB-4. This sample both assessed native soil conditions directly beneath the contaminated non-native/native layer interface and also delineated the elevated concentrations of the VOCs naphthalene and total xylenes previously identified in the sample collected from 7 to 9 feet bgs in EB12. No elevated PID readings or visual or olfactory evidence of impacts were observed and no VOCs were detected above the UUSCOs, PGWSCOs, or RRSCOs in LSB-4.
- 18 SVOCs (3 & 4 methylphenol, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, phenol, and pyrene) were detected above the UUSCOs, RRSCOs, and/or PGWSCOs in five samples collected from within the

contaminated non-native material layer at EB09, EB12, LSB-4, LSB-5 and LSB-6 at depths ranging from 0 to 9 feet bgs. SVOCs were not detected above the UUSCOs, RRSCOs, and/or PGWSCOs in any samples collected from directly beneath the contaminated non-native/native material interface or within the native material.

- The pesticide 4,4'-DDT was detected above the UUSCOs in one sample collected from within the contaminated non-native material layer at LSB-4 from 0 to 2 feet bgs. No pesticides were detected above PGWSCOs or RRSCOs in this AOC. Pesticides were not detected above the UUSCOs, RRSCOs, and/or PGWSCOs in any samples collected from directly beneath the contaminated non-native/native material interface or within the native material.
- Seven metals, including arsenic, barium, trivalent chromium, copper, lead, mercury, and zinc, were detected above the UUSCOs, RRSCOs, and/or PGWSCOs in samples collected from within the contaminated non-native material layer at EB09, EB10, EB12, EB13, LSB-1, LSB-2, LSB-4, LSB-5, LSB-6, and LSB-7 at depths ranging from 0 to 9 feet bgs. Of these, two metals, mercury and nickel, were detected above the UUSCOs in the samples collected directly beneath the contaminated non-native/native material interface at LSB-3 and LSB-4 at depths ranging from 8 to 15 feet bgs. Only nickel was detected above the UUSCOs in the samples collected in the native material at LSB-3 and LSB-4 at depths ranging from 20 to 22 feet bgs.
- PFOA was detected above the UU and PGW Guidance Values in LSB-1 from 8 to 10 feet bgs and above the UU Guidance Values in LSB-5 and LSB-7 from 13 to 15 feet bgs and 8 to 10 feet bgs, respectively, all of which were collected directly beneath the contaminated non-native/native material interface. No PFAS compounds were detected above the RR Guidance Values in the non-native samples, and PFAS were not detected above the UU, RR, and/or PGW Guidance Values in any samples collected from the native material. Samples collected during the 2015 SI were not analyzed for PFAS compounds.

Soil Vapor

Soil vapor points LSV-1 and LSV-2A through LSV-8A were installed within the contaminated non-native material layer during the 2021 Remedial Investigation and soil vapor points SV01 through SV03 were installed within the contaminated non-native layer during the 2015 SI. Analytical results for samples also collected to characterize AOC-1 (LSV-2A, LSV-4A, LSV-5A, LSV-7A, SV02, SV03) and AOC-2 (LSV-2A and LSV-8A) are addressed in Sections 6.7.1 and 6.7.2, respectively, and are excluded from discussion below. A summary of the remaining

soil vapor analytical results (LSV-1, LSV-3A, LSV-6A, and SV01) installed within the contaminated non-native material layer are summarized as follows:

- NYSDOH Soil Vapor Intrusion Matrix compounds were not identified above the monitoring and/or mitigation thresholds if detected as part of a soil vapor intrusion evaluation in samples LSV-1, LSV-3A, LSV-6A, or SV01.
- Petroleum-related VOCs including 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and BTEX compounds, were detected in all soil vapor samples collected.

AOC-3 Conclusions

Elevated concentrations of VOCs, PAHs, metals, pesticides, and PFAS are attributable to contaminated material of unknown origin, and in the case of PAHs are also attributable to historical site operations, discussed in Section 6.7.1.

As discussed in Section 6.7.1, TCE was identified at the shallow and deep samples collected at LSV-7 above the NYSDOH Soil Vapor Intrusion Matrix monitoring and/or mitigation threshold if detected as part of a soil vapor intrusion evaluation and is likely attributable to historical surrounding dry-cleaners (AOC-2) and not the contaminated non-native material of unknown origin. Petroleum-related VOCs including BTEX compounds, 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene were detected in all soil vapor samples collected across the Site, including those associated with AOC-3, and are attributable to historical Site operations, including the potential former presence of USTs (AOC-1) and historic adjacent and surrounding Site operations including the adjacent NYSDEC Spill Site at 1 Hanson Place (AOC-2).

2.3.3 Nature and Extent of Contamination

2.3.3.1 Soil Contamination

During environmental investigations completed by Langan in 2015 and 2021, a contaminated non-native material layer consisting of fine to coarse sand with varying proportions of silt, gravel, and clay and miscellaneous debris, including brick, wood, concrete, tile, glass, coal, and slag extending from surface grade to between 5 and 13 feet bgs was observed corresponding to an average depth of el 37 NAVD88 across the site footprint. Twelve samples were collected from between ground surface and 9 feet bgs, nine samples were collected from directly beneath the contaminated non-native/native material interface from between 8 and 15 feet bgs, and eight samples were collected within the native material from between 20 and 44 feet bgs during the 2015 and 2021 investigations.

The VOCs naphthalene and total xylenes were detected above the UUSCOs and/or PGWSCOs in one contaminated non-native material layer sample collected that is associated with AOC-1. No other VOCs were detected above the UUSCOs, RRSCOs, or PGWSCOs in any contaminated non-native material or native soil samples collected.

SVOCs including acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene were detected from 0 to 2, 5.4 to 5.5 and 7 to 9 feet bgs in 6 of 12 samples collected for SVOC analysis throughout the Site footprint at concentrations exceeding the UUSCOs, RRSCOs, and/or PGWSCOs. SVOCs 3 and 4 methylphenol, dibenzofuran, and phenol were also detected above the UUSCOs, RRSCOs and/or PGWSCOs on one sample collected from 7 to 9 feet bgs within the northern portion of the Site during the 2015 SI. SVOCs were not detected in exceedance of the applicable SCOs or RUSCOs in samples collected from directly beneath the contaminated non-native/native material interface or deeper within the native material.

Metals including arsenic, barium, trivalent chromium, copper, lead, mercury, nickel, and/or zinc were detected from 0 to 2, 4.5 to 5.5, and 7 to 9 feet bgs in all 12 fill samples collected, 8 to 10 and 13 to 15 feet bgs in two of the samples collected directly beneath the contaminated non-native/native material interface, and 20 to 22 feet bgs in two of the samples collected within the native material throughout the Site footprint at concentrations exceeding UUSCOs, RRSCOs, and/or PGWSCOs.

Pesticides were not detected in exceedance of the applicable SCOs or RUSCOs in any of the samples collected with exception of the pesticide 4,4'-DDT that was detected from 0 to 2 feet bgs at a concentration exceeding the UUSCOs in only one sample.

PFAS compounds were detected from 8 to 10 and 13 to 15 feet bgs in two of the samples collected directly beneath the contaminated non-native/native material interface in exceedance of the UU and/or PGW Guidance Values during the 2021 RI. PFAS was not analyzed for samples collected during the 2015 SI.

Elevated concentrations of PAHs, metals, pesticides, and PFAS in near-surface contaminated material (including contaminated non-native material and native material directly beneath the contaminated non-native material/native material interface) are attributed to site filling. The only contaminant detected deeper within the native material above the UUSCOs was nickel. Contaminants at concentrations above UUSCOs, RRSCOs, or PGWSCOs were not identified in

the deepest native soil samples collected from the two-foot interval above the observed groundwater interface (i.e., either 40 to 42 feet bgs or 42 to 44 feet bgs).

2.3.3.2 Groundwater Contamination

Groundwater was encountered between 38.79 and 41.98 feet bgs at depths corresponding to el 2.25 to 2.85 NAVD88 during the RI. One monitoring well was sampled during the 2015 SI and six monitoring wells were sampled during the 2021 RI.

The VOC chloroform was detected above the AWQSGVs in all groundwater samples collected during the 2015 SI and 2021 RI. However, as it was not detected or was only marginally detected above the reporting limit in soil samples collected across the Site, these exceedances may be attributed to an unidentified off-Site source. TCE was also detected above the AWQSGVs in MW-11 located within the central-eastern portion of the site, but only during the 2021 RI. TCE is a daughter product of PCE, a chlorinated solvent used in dry cleaning processes. As such, the detection of TCE may be attributed to historical non-adjacent surrounding dry-cleaning operations or another unidentified off-Site source. No other VOCs were detected above the AWQSGVs.

PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and/or indeno(1,2,3-cd)pyrene were detected at concentrations exceeding the AWQSGVs in two of the six monitoring wells sampled for groundwater. These monitoring wells are both located in the eastern portion of the Site, adjacent to St. Felix Street. The SVOC bis(2ethylhexyl)phthalate was also detected at a concentration exceeding the AWQSGV in one monitoring well in the western portion of the Site. Elevated concentrations of PAHs in groundwater may be attributed to the historical on-Site operations, including potential historical petroleum storage, the adjacent NYSDEC Spill Site at 1 Hanson Place, or another unidentified off-Site source.

Total PCBs were detected marginally in exceedance of the NYSDEC AWQSGVs at only two wells. It should be noted that PCBs were also detected in the method blanks associated with these samples and as such, the marginal exceedances above the AWQSGVs at these locations may be due to laboratory contamination.

Metals including total iron, total manganese, dissolved manganese, total sodium, and/or dissolved sodium were detected at concentrations exceeding the AWQSGVs in all six monitoring wells sampled for groundwater throughout the Site footprint. Total lead was also detected in exceedance of the AWQSGVs at LMW 3; however, dissolved lead concentrations were detected below the AWQSGVs. Total chromium was also detected in exceedance of the AWQSGVs at

MW-11 during the 2015 SI only; however, dissolved total chromium concentrations were detected below the AWQSGVs. Total lead was detected in exceedance of the NYSDEC AWQSGVs at only one location located in the northeastern corner of the Site. As such, this total lead exceedance may be attributed to elevated turbidity during sample collection or an unidentified off-Site source. Total chromium, which was detected in exceedance of the AWQSGVs at MW-11 in 2015 but not 2021, may be attributed to elevated turbidity during sample collection. Other metals detected in groundwater above the AWQSGVs (total iron, total and dissolved manganese, and total and dissolved sodium) are attributed to naturally occurring background concentrations.

PFAS compounds were detected in all groundwater samples during the 2021 RI. PFOS was detected in one monitoring well and PFOA was detected in all monitoring wells above the AAWQSGVs. PFAS was not analyzed for samples collected during the 2015 SI. The presence of PFAS compounds in groundwater may be attributable to historical and active surrounding dry-cleaning/laundry facilities or an unidentified off-Site source.

Groundwater sample analytical results did not identify the presence of pesticides or herbicides at concentrations above the AWQSGVs in any samples for which they were analyzed.

2.3.3.3 Soil Vapor Contamination

Three shallow soil vapor samples were collected during the 2015 SI and eight shallow and seven deep soil vapor samples were collected during the 2021 RI. Analytical results revealed the CVOC TCE at concentrations which would be above the monitoring and/or mitigation threshold according to NYSDOH Soil Vapor Intrusion Guidance Matrix A if detected as part of a soil vapor intrusion evaluation in both the shallow and deep samples collected at one location during the 2021 Remedial Investigation. Soil vapor sample analytical results also identified elevated concentrations of 2-Butanone and petroleum-related VOCs including BTEX compounds, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene at all sample locations throughout the site footprint.

Although TCE was not detected at concentrations exceeding NYSDEC SCOs in soil samples collected across the Site and was not detected exceeding NYSDEC AWQSGVs in groundwater at the monitoring well collocated with LSV 7A/B (LMW-4), TCE was detected in one nearby monitoring well (MW-11) at a concentration exceeding the AWQSGV. The presence of TCE in groundwater and soil vapor is attributed to either historic surrounding dry-cleaning facilities or an unknown off-Site source. Petroleum compounds detected in soil vapor may be attributable to historical site operations as a garage/gasoline station and the potential historical use of USTs,

historic adjacent or surrounding site operations and/or petroleum releases, or an unknown off-Site source. Additionally, 2-Butanone detected in soil vapor may be attributable an unknown off-Site source.

2.4 Qualitative Human Exposure Assessment

Based upon the CSM and the review of environmental data, incomplete exposure pathways appear to be present under current conditions, and in the absence of institutional and engineering controls, complete on-Site exposure pathways could potentially exist during construction/remediation if not mitigated by the HASP, CAMP, and SMMP. Under proposed future conditions on-Site sources of contamination will be excavated and transported for off-Site disposal and any remaining residual contamination will be addressed via the implementation of engineering and institutional controls as part of the remedial action will eliminate exposure.

Complete exposure pathways have the following five elements: 1) a contaminant source; 2) a contaminant release and transport mechanism; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population. A discussion of the five elements comprising a complete pathway as they pertain to the Site is provided below.

In addition to the human health exposure assessment, NYSDEC DER-10 requires an on-Site and off-Site Fish and Wildlife Resources Impact Analysis (FWRIA) if certain criteria are met. Based on the requirements stipulated in Section 3.10 and Appendix 3C of DER-10, a FWRIA for the Site is not required.

2.4.1 Current Conditions

Contaminant sources include contaminated non-native material and soil with elevated levels of VOCs, SVOCs, metals, and pesticides; groundwater with elevated levels of VOCs, SVOCs, PCBs, and metals; and soil vapor with elevated levels of VOCs.

Contaminant release and transport mechanisms include contaminated soil transported as dust (dermal, ingestion, inhalation) and existing soil vapor contaminants (inhalation). Under current conditions, the likelihood of human exposure is limited, as 1) Site access is restricted to project team members and authorized personnel; 2) impermeable asphalt surfaces cover the Site; 3) the Site is an open-air vacant lot and impacted soil vapor that migrates vertically would be diluted with ambient air; and 4) the Site is not a source of drinking water.

2.4.2 Remediation Activities

During remedial construction, points of exposure include disturbed and exposed soil during excavation and dust and organic vapors generated during Site work. Routes of exposure include ingestion and dermal absorption of contaminated soil and groundwater and inhalation of dust and organic vapors associated with the contamination found in soil. The receptor population includes construction and remediation workers and, to a lesser extent, the public adjacent to the Site.

The potential for completed exposure pathways is present since all five elements (a contaminant source, a contaminant release and transport mechanism, a point of exposure, a route of exposure, and a receptor population) exist; however, the risk will be minimized by limiting Site access and through implementation of appropriate health and safety measures, such as work zone and perimeter air monitoring for organic vapors and dust, using vapor and dust suppression measures, maintaining Site security, and wearing the appropriate personal protective equipment (PPE), and through implementation of SMMP measures including cleaning truck undercarriages before they leave the Site to prevent off-Site soil tracking. Potential exposures to the properties adjacent to the Site will be mitigated by the implementation of a HASP, CAMP, and SMMP as discussed below.

2.4.3 Proposed Future Conditions

Remedial excavation is required to an elevation of el 39 NAVD88 (corresponding to between 7 to 10.5 feet bgs) based on the results in the 2015 SI and 2021 RIR to achieve a Track 2 remedy on 84% of the Site. Construction for the proposed development will also require excavation to el 32.5 NAVD88 (corresponding to between 13.5 to 17 feet bgs) in this area. Deep excavation is not anticipated for the remaining 16% of the site where a Track 4 remedy will be completed. Isolated areas of deeper excavation to depths of up to 23 feet bgs will be required for construction of elevator/sump pits and sub-grade foundation elements including pile caps, footings, and grade beams. Confirmation sampling will occur at the remedial depth to document achievement of the Track 2 SCOs at the remedial depth prior to commencing development-related excavation. Under proposed future conditions, engineering (including the concrete loading dock in the Track 4 area) and institutional controls will be included to eliminate exposure to residual contaminants and to ensure future enforcement of those controls.

Contaminant release and transport mechanisms include penetrations through the building and concrete-loading dock along Ashland Place. If protective measures and remediation are not implemented, points of exposure include potential cracks in the proposed building foundation and the setback and exposure during any future soil-disturbing activities. Routes of exposure

may include inhalation of vapors entering the buildings or dust during any soil-disturbing work. The receptor population includes the building tenants, visitors to the building, and building management/maintenance employees. The possible routes of exposure can be avoided or mitigated if a Track 2 cleanup cannot be achieved within the majority of the Site where the building include installation of soil vapor mitigation measures, construction and maintenance of a Site cover system (i.e., concrete or at least two foot of clean soil meeting RRSCOs), and implementation of a Site Management Plan.

2.4.4 Human Health Exposure Assessment Conclusions

1. Under current conditions, there is a marginal risk for exposure unless health and safety measures are implemented. The primary exposure pathways are for dermal contact, ingestion and inhalation of soil or soil vapor by authorized Site personnel in instances where the integrity of the asphalt layer is compromised or during Site investigation. This is a low risk since the Site is paved. Exposure to groundwater is limited to those completing investigation activities. The exposure risks can be avoided or minimized by limiting Site access and implementing the appropriate health and safety and vapor and dust suppression measures outlined in a Site-specific HASP and CAMP during ground-intrusive activities.
2. In the absence of protective measures, there is a moderate risk of exposure during the construction and remediation activities. The primary exposure pathways are:
    a. Dermal contact, ingestion and inhalation of contaminated soil, groundwater, or soil vapor by Site visitors and construction and remediation workers.
    b. Dermal contact, ingestion and inhalation of soil (dust) and inhalation of soil vapor by the community in the vicinity of the Site.

    These exposure pathways can be avoided or minimized by performing community air monitoring and by following the appropriate health and safety plans, implementing vapor and dust suppression techniques, and using Site security to control access.
3. A complete exposure pathway is possible for the migration of Site contaminants in the form of dust to off-Site human receptors during the remedial construction phase. During this phase, Site access will be limited to authorized personnel and workers and protective measures will be used during construction to prevent completion of this pathway, including following a Site-specific HASP and implementation of a CAMP and SMMP.

4. The existence of a complete exposure pathway for Site contaminants to human receptors during proposed future conditions is unlikely, as on-Site sources of contamination will be excavated and transported for off-Site disposal and any remaining residual contamination will be addressed via the implementation of engineering and institutional controls as part of the remedial action. Regional groundwater is not used as a potable water source in this part of New York City. The potential pathway for soil vapor intrusion into the building, likely a result of migration of CVOCs from an off-Site source, will be minimized for occupied portions of the building basement by at a minimum the foundation walls, new building slabs and a vapor barrier.

2.5 Remedial Action Objectives

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified:

2.5.1 Soil

RAOs for Public Health Protection:

- Prevent ingestion/direct contact with contaminated soil

RAOs for Environmental Protection:

- Prevent migration of contaminants that would result in groundwater or surface water contamination

2.5.2 Groundwater

RAOs for Public Health Protection:

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater

2.5.3 Soil Vapor

RAOs for Public Health Protection:

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into the buildings at the Site

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

This section presents an analysis of the proposed remedial alternatives that can potentially be achieved under the BCP. The proposed SCOs under Alternative I will be the Part 375 Unrestricted Use SCOs under a Track 1 cleanup. Alternative II will be a combined Track 2 and Track 4 cleanup utilizing the Part 375 RRSCOs and Site Specific SCOs and implementation of long-term institutional controls in the form of a Site Management Plan and an Environmental Easement. Both alternatives are expected to achieve the established RAOs. SCOs for Alternatives I and II are presented in Table 4.

The Alternatives presented below assume, based on the results of the RI, that all non-native material is contaminated above the Track 1 SCOs. Non-native material was encountered during the investigations in all borings to depths ranging from 5 to 9 feet bgs in the western portion of the Site and 7 to 13 feet bgs in the eastern portion of the Site. The contamination in this material and the volume required for remediation under Alternative I will be confirmed by performing a PDI to determine the extents of the Track 1 SCO exceedances.

3.1 Technical Description of Alternative I – Track 1

Alternative I, a Track 1 remedy, would include the following tasks:

- Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:
    - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
    - Reducing direct and indirect greenhouse gases and other emissions;
    - Increasing energy efficiency and minimizing use of non-renewable energy;
    - Conserving and efficiently managing resources and materials;
    - Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
    - Maximizing habitat value and creating habitat when possible;
    - Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
    - Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and

- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

As part of the remedial program, to evaluate the remedial alternatives with respect to green and sustainable remediation principles, a SiteWise™ an environmental footprint analysis has been completed. Water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use for the proposed remedy have been estimated, and goals for the project related to these green and sustainable remediation metrics, as well as for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial program, as appropriate. The project will include detailed requirements to achieve the green and sustainable remediation goals. Further, progress with respect to green and sustainable remediation metrics that have been established by the SiteWise™ model will be tracked during implementation of the remedial action and reported in the Final Engineering Report (FER), including a comparison to the goals established during the remedial program.

- Development and implementation of a CHASP and CAMP for the protection of on-Site workers, community/residents, and the environment during remediation and construction activities.
- Performance of a PDI to vertically and horizontally define the extents of the Track 1 SCO exceedances. Within the building footprint, the PDI will characterize the material located in the interval between the samples collected during the 2021 RI and the deeper proposed soil excavation depth. Within the remainder of the Site, the PDI will identify the depth at which Track 1 Unrestricted Use SCOs can be achieved. Borings will be completed at a frequency of 1 per 1,200 square feet and soil samples will be collected across two-foot intervals to confirm the extents of the contaminated non-native material. Additionally, horizontal and vertical delineation samples will be collected for two hotspot areas with elevated concentrations of nickel above the UUSCO to identify the extents of remediation required. A work plan will be prepared and submitted to NYSDEC for approval prior to performance of the PDI.
- Construction of the support of excavation (SOE) system between 9 and 23 feet bgs to facilitate the Track 1 remediation.
- Implementation of soil erosion, pollution and sediment control measures in compliance with applicable laws and regulations.

- Screening for indications of contamination (by visual means, odor, and monitoring with PIDs) of excavated material during intrusive Site work.
- Excavation, stockpiling, off-Site transport, and disposal of all contaminated material that exceeds Unrestricted Use SCOs as defined by 6 NYCRR Part 375-6.8(a) which exists at the Site to a depth ranging from approximately 5 to 9 feet bgs on the western portion of the Site to 7 to 13 feet bgs on the remainder of the Site (to be confirmed as part of the PDI) including VOC, SVOCs, pesticides, and metals impacted material throughout the Site footprint.
    - Additional hotspot excavations to remove elevated concentrations of PFAS above the UU and/or PGW Guidance Values will be completed throughout the Site as follows:
        - One 10- by 10-foot hotspot area in the western portion of the Site will be excavated to el 35 NAVD88 (corresponding to 10 feet bgs).
        - One 10- by 10-foot hotspot in the eastern portion of the Site will be excavated to el 34 NAVD88 (corresponding to approximately 15 feet bgs). This area will be removed with the construction of foundation elements of the proposed building.
    - Additional hotspot excavations to remove elevated concentrations of nickel above the Unrestricted Use SCOs will be completed throughout the Site as follows:
        - One 10- by 10-foot hotspot in the central portion of the Site will be excavated to el 24 NAVD88 (corresponding to approximate 23 feet bgs). The vertical and horizontal remedial extents will be determined based on the results of confirmation soil sampling.
        - One 10- by 10-foot hotspot in the eastern portion of the Site will be excavated to el 25 NAVD88 (corresponding to approximately 23 feet bgs). The vertical and horizontal remedial extents will be determined based on the results of confirmation soil sampling.
- Appropriate off-Site disposal of material removed from the Site in accordance with federal, state and local rules and regulations for handling, transport, and disposal.
- Removal and decommissioning of any encountered USTs and/or associated appurtenances (e.g., fill lines, vent line, and electrical conduit) and disposal off-Site during Site redevelopment in accordance with DER-10, 6 NYCRR Part 612.2(d) and 613.9, NYSDEC CP-51, and other applicable NYSDEC UST closure requirements.

- Collection and analysis of confirmation soil samples from the excavation base and sidewalls of the excavation, in accordance with DER-10 to confirm Track 1 SCOs were achieved. Collection of confirmation or documentation soil samples for hotspot areas from the center of the base and sidewalls of the hotspot excavation. No additional excavation is anticipated; however, any remedial excavation that is completed beyond that presented in this RAWP will be documented in daily reports.
- Importation and backfilling of remediated areas, as necessary for development, with certified-clean material (meeting Track 1 SCOs), recycled concrete aggregate (RCA), or virgin, native crushed stone.
- Reuse of Site soil meeting the Track 1 SCOs, if necessary.
- Installation of a vapor barrier membrane below the slab of the proposed building and along sidewalls of any subgrade foundation elements beneath occupied spaces as a green remediation component.

The Alternative I remediation extent is shown on Figure 8 and is based on data presented in the RIR.

3.1.1 On-Site Worker, Public Health, and Environmental Protection

A Site-specific CHASP will be enforced during excavation and foundation construction to protect on-Site workers from accidents and acute and chronic exposures to the identified contaminated media. Public health will be protected by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures included in the CAMP (Section 5.4.12 of the RAWP). The CAMP will include continuous perimeter monitoring of dust and organic vapor using DustTrak aerosol monitors and PIDs capable of recording data and calculating 15-minute averages. A field engineer, scientist, or geologist will monitor Site perimeters for visible dust and odors. The environment will be protected by implementing and enforcing the appropriate soil erosion prevention measures.

3.1.2 SOE Construction and Contaminated Soil Removal

A SOE system will be constructed between 9 and 23 feet bgs as follows:

- Around the perimeter of the cellar excavation area to accommodate the remedial excavation depth of between 13.5 to 23 feet below current Site grade (range due to variation in Site topography) for the removal of contaminated material as well as two nickel hotspot areas in the eastern and central portions of the Site; and,

- Around the perimeter of the loading dock area (western portion of the Site) to accommodate the remedial excavation of between 9 and 10 feet below current Site grade for the removal of contaminated material and a PFAS hotspot.

The SOE around the cellar excavation area will be constructed to also accommodate the development and associated foundation construction. In the area of the future loading dock however, the SOE would only be required for the remedy. As such, the entire excavation in the loading dock area would need to be backfilled to bring the site to development grade.

The total estimated volume of material requiring remediation and off-Site disposal for a Track 1 cleanup is approximately 5,800 CY (to be confirmed as part of the PDI). This estimate is based on the assumed volume of non-native contaminated material, which was identified as requiring remediation due to exceedances of the Track 1 SCOs, based on the field observations and laboratory analytical results presented in the 2015 SI and the 2021 RI. The excavated material will be transported and disposed off-Site in accordance with municipal, state, and federal regulations. The estimated extent of the remedial excavation for Alternative I is estimated on Figure 8. However, this estimate is subject to change pending the PDI and confirmation sampling results.

VOCs, SVOCs, metals, and PFAS were detected at concentrations that exceed the Track 1 Unrestricted Use SCOs or Unrestricted Use Guidance Values. The Track 1 remedy that would be completed for the Site includes the excavation and off-site disposal of the soil that exceeded the Track 1 SCOs in the 2015 SI, the 2021 RIR, and future PDI to a maximum anticipated depth of approximately 13 feet of contaminated material within the cellar footprint of the proposed building and approximately 9 feet of contaminated material beneath the proposed loading dock area. In addition, the excavation of four hotspots will be completed: one minimum 10- by 10-foot PFAS hotspot excavation centered on LSB-1 to a minimum of 10 feet bgs beneath the proposed loading dock area; one minimum 10- by 10-foot PFAS hotspot excavation centered on LSB-5 to a minimum of 15 feet bgs within the proposed cellar footprint; and two minimum 10- by 10-foot nickel hotspot excavations centered on LSB-3 to a minimum of 23 feet bgs and LSB-4 to a minimum of 23 feet bgs within the proposed cellar footprint. These hotspot excavations will be completed to remove RI samples with analytical results exceeding the Track 1 SCOs and/or Guidance Values. The vertical and horizontal extents of the proposed hotspot excavations will be determined by the results of confirmatory soil analytical results.

Whether additional remedial excavation is needed to meet the planned Track 1 remedy will depend on the analytical results of confirmation sampling that will be completed. Isolated areas of deeper excavation to depths of up to 23 feet bgs (corresponding to el 26 NAVD88) will be required for construction of elevator/sump pits and sub-grade foundation elements including pile caps, footings, and grade beams. If sample results in these areas do not achieve the Track 1 SCOs at the proposed soil excavation depths, sampling at two-foot intervals below this depth will also be completed to determine if it is feasible to achieve Track 1. The contaminated material layer and the PFAS hotspot area within the cellar footprint of the proposed building are shallower than the required development depth and will be removed as part of the Track 1 remedy.

The nickel hotspot areas however extend to 23 feet bgs, which is deeper than the development depth. Confirmatory soil sampling would be performed at these two locations in order to delineate the nickel impacts, details of which are discussed in Section 3.1.4 below.

The contaminated material on the western portion of the property beneath the proposed loading dock area will be excavated to 9 feet bgs corresponding to approximately el 36 feet NAVD88, beyond the required development depth of el 43 feet NAVD88. Additionally, as mentioned above, a PFAS hotspot area of 10- by 10-feet by 10 feet bgs centered around RI boring LSB-1 within this area would also be excavated beyond the required development depth.

It is not anticipated that excavation will extend into the groundwater table; as such, implementation of a dewatering system is not required.

3.1.3 UST System Removal

Although no subsurface metallic anomalies were identified during the 2020 geophysical survey or 2021 RI, the potential exists for USTs to be encountered during Site remediation as historical Site operations consisted of an at-grade asphalt-paved parking lot since at least 1950 and the Site has been historically classified as a garage/gasoline station.

Any USTs encountered during remedial excavation, will be decommissioned in accordance with applicable NYSDEC tank closure requirements, including DER-10 Section 5.5 and 6 NYCRR Part 612.2(d) and 613.9, and NYSDEC CP-51. USTs and/or associated appurtenances will be registered and administratively closed with the NYSDEC petroleum bulk storage (PBS) unit. All excavation areas will be screened and inspected for the presence of petroleum-impacts to the surrounding soils. Petroleum-impacted soil, if encountered, will be excavated, stockpiled separately, characterized, and disposed of off-Site at a permitted disposal facility in accordance with applicable regulations. If the remedial or development excavation does not extend beyond

the bottom of the encountered tank, additional confirmation soil samples will be collected as described below.

Following removal of UST(s), affidavits of closure will be submitted to the FDNY, and PBS registration/de-registration applications will be submitted to NYSDEC if one or more tank systems store a combined capacity of more than 1,100 gallons or more of petroleum in aboveground and/or underground storage tanks; or one or more underground tank systems that are designed to store 110 or more gallons of petroleum.

3.1.4 Confirmation Soil Sampling

After the soil is removed to the remedial depth determined by the PDI, confirmation soil samples will be collected at the remedial depth determined by the PDI at a frequency of one per 900 square feet and from excavation sidewalls at a frequency of one per 30 linear-feet outside the footprint of the building. Sidewall samples will not be collected from the Site perimeter around the proposed building footprint on the eastern portion of the Site because excavation will extend across the Site footprint and SOE measures (e.g., sheeting and lagging) will preclude access to soil sidewalls. Sidewall samples will, however, be collected along the perimeters of the Site footprint from the base of the excavation sidewall on the western portion of the Site. A total of 21 confirmation soil samples (14 base samples and seven sidewall samples), plus QA/QC samples, will be collected to confirm remedial performance and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane. In the event that the confirmatory samples do not achieve Track 1 SCOs, additional samples will be obtained in two-foot intervals down in order to determine if Track 1 can be achieved and then under this alternative, additional excavation would continue past the planned depth of construction if Track 1 was not achieved.

For each nickel hotspot area (LSB-3 and LSB-4) and PFAS hotspot areas, four sidewall samples and one bottom sample would be collected as confirmation samples to confirm the extents of hotspot excavation required during construction. Horizontal delineation of each hotspot area will be completed centered on each hotspot boring location in a 10- by 10-foot area. Contingent horizontal delineation will be completed in 5-foot increments in each direction. Vertical delineation will be competed at the 2-foot interval beyond the excavation area, with contingent samples at 2-foot intervals beyond the original vertical delineation sample. Sample analysis for the sidewall and bottom samples would be limited to the contaminant of concern for its respective hotspot.

In the event that unidentified USTs are discovered during Site remedial activities, if the remedial or development excavation does not extend beyond the bottom of the encountered tank, five documentation samples will be collected from each excavation and will consist of one sample per excavation sidewall and a sample from each excavation base in accordance with the requirements of DER-10 Section 5.4(b)(5). Samples will be analyzed for Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane.

3.1.5 Excavation Backfill

After the Track 1 remedial excavation of the hotspots, portions of the Site would be backfilled where necessary to restore the Site grade to the development elevation needed for foundation construction, and any imported backfill shall comply with 6 NYCRR Part 375-6.7(d), NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10, and Appendix 5, and the April 2023 Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs. All material proposed for import to the Site would be submitted to NYSDEC for review and approval prior to the proposed import activity. The NYSDEC Request to Import/Reuse Fill or Soil form (Revised April 2023) would be included as part of the submission. A copy of the Request to Import/Reuse Fill or Soil form is included in Appendix C.

Imported material for excavation backfill would consist of fill that meets the Track 1 SCOs, Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs guidance document (April 2023), and Part 360.13(f) requirements for acceptable fill material uses, or other acceptable fill material such as virgin stone from a quarry or RCA. If RCA is imported to the Site, it would come from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. RCA imported from compliant facilities would not require chemical testing, unless required by NYSDEC under its terms for operation of the facility. Imported RCA must be derived from recognizable and uncontaminated concrete (less than 10% by weight passing through a No. 100 sieve). RCA is not acceptable for, and would not be used as, Site cover or drainage material.

3.1.6 Green and Sustainable Remediation

Alternative I was evaluated with respect to green and sustainable remediation principles. An environmental footprint analysis was completed using SiteWise™ (available in the SURF library) which is a NYSDEC accepted environmental footprint analysis calculator. Two components of the remedy were evaluated: site preparation and the remedy. The site preparation for the Track 1 remedy includes the performance of the PDI, which is summarized in Section 3.1, and a waste

characterization investigation. Waste characterization sampling will be performed exclusively for the purposes of off-Site soil disposal in a manner suitable to receiving facilities and in conformance with applicable federal, state and local laws rules and regulations and facility-specific permits. For the purposes of completing the SiteWise™ analysis, we have assumed that the amount of contaminated soil to be characterized, excavated and disposed of for implementation of the remedy is approximately 5,800 cubic yards.

The remedy component includes the excavation of 5,800 cubic yards of contaminated soil, construction of a deep SOE system extending to depths between 9 and 23 feet bgs to facilitate the contaminated soil removal down to depths of 23 ft bgs, and the collection of confirmation soil samples for performance monitoring purposes. The Track 1 remedy would be completed over 5 months.

Using the above identified information, the SiteWise™ model estimated the following emissions and total energy usage for the implementation of a Track 1 remedy:

Remedial Alternatives	Alt I - Track 1
Greenhouse Gas (GHG) Emissions (metric ton)	186.97
Total energy Used (MMBTU)	2,305.46
Total NOx Emissions (metric ton)	0.60
Total SOx Emissions (metric ton)	0.50
Total PM10 Emissions (metric ton)	0.29

Details regarding the inputs and outputs of the SiteWise™ model are provided in Appendix D.

3.2 Technical Description of Alternative II – Combined Track 2 and Track 4

Alternative II, a combined Track 2 and Track 4 remedy, would include the following tasks:

- Green and Sustainable Remediation as defined in Section 3.1 above.
- Development and implementation of a CHASP and CAMP for the protection of on-Site workers, community/residents, and the environment during remediation and construction activities.

- Construction of the SOE system to a depth range of 7 to 10.5 feet bgs to facilitate the Track 2 remedial excavation.
- Excavation, stockpiling, off-Site transport, and disposal of all soil that exceeds the Track 2 RRSCOs as defined by 6 NYCRR Part 375-6.8(b) to el 39 NAVD88 (corresponding to between 7 and 10.5 feet bgs) across approximately 84% of the Site footprint within the Track 2 portion of the Site based on the 2015 SI and 2021 RI data and to el 43 NAVD88 (corresponding to 2 feet bgs) across the remaining 16% of the Site footprint for construction of a loading dock and building foundation elements within the Track 4 portion of the Site.
- Collection and analysis of: confirmation soil samples from the Track 2 portion of the Site at the remedial elevation of el 39 NAVD88 (between 7 and 10.5 feet bgs), in accordance with DER-10 to confirm if the Track 2 RRSCOs were achieved; documentation soil samples in the Track 2 portion of the Site where overall construction excavation depths are greater than 15 feet bgs and the Track 2 RRSCOs were not achieved in order to document any remaining exceedances that may be present below this depth; and documentation soil samples in the Track 4 portion of the Site to document soil quality remaining at the Site. If the results of the confirmation soil samples identify Track 2 RRSCO exceedances, additional samples will be taken in two-foot intervals down to the planned depth of soil excavation or 15 feet bgs to determine the depth at which Track 2 SCOs can be achieved.
- Importation and backfilling of remediated areas and placement of additional fill as necessary to raise the remedial excavations areas to development grade with material meeting the RRSCOs, recycled concrete aggregate (RCA), or virgin, native crushed stone in compliance with 6 NYCRR 375-6.7(d).
- Reuse of Site soil meeting the RRSCOs to backfill the excavation and/or establish design grades at the Site, as needed in compliance with NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10. A NYSDEC Request to Import/Reuse Fill or Soil form (Revised April 2023; provided in Appendix C) will be submitted to NYSDEC in advance of any proposed reuse action.
- As part of the Track 4 portion of the remedy, installation of a Site cover system, including the concrete-paved loading dock to prevent human exposure to remaining contaminated soil/fill.
- Completion of a survey to document the extents of the Track 2 remediation, the Track 4 remediation, and the Site cover system.

- Establishment of use restrictions including prohibitions on the use of groundwater from the Site and prohibitions on sensitive Site uses, such as farming or vegetable gardening, to eliminate future exposure pathways.
- Recording of an Environmental Easement (EE) to memorialize the remedial action and the engineering and institutional controls to ensure that future owners of the Site continue to maintain these controls as required.
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of remaining contamination as required by the EE, including plans for: (1) engineering and institutional controls, (2) monitoring, (3) operation and maintenance, and (4) reporting.
- A provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the Site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion.

The Alternative II remediation extent is estimated on Figure 9 and is based on data presented in the RIR. This alternative would allow for the completion of a Track 2 cleanup in the majority of the Site that will be occupied by future residents in the future proposed building, which will occupy approximately 84% of the Site, and a Track 4 cleanup for the portions of the Site that will be occupied by a loading dock (representing approximately 16% of the Site). The requirements for each of the Alternative II tasks are described below.

3.2.1 On-Site Worker, Public Health, and Environmental Protection

A Site-specific CHASP will be enforced during excavation, Site work, and foundation construction to protect on-Site workers from accidents and acute and chronic exposures to the identified contaminated media. The CHASP is included as Appendix E. Public health will be protected by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures included in the CAMP (Section 5.4.12 of the RAWP). The CAMP will include continuous perimeter monitoring of dust and organic vapor using DustTrak aerosol monitors and PIDs capable of recording data and calculating 15-minute averages. A field engineer, scientist, or geologist will monitor Site perimeters for visible dust and odors. The environment will be protected by implementing and enforcing the appropriate soil erosion prevention measures.

3.2.2 SOE Construction and Contaminated Soil Removal

SVOCs and metals were detected at concentrations that exceed the Track 2 RRSCOs between 0 and 9 feet bgs. The deepest sample with exceedances of the RRSCOs was the 7 to 9 feet bgs sample (corresponding to el 39 to 41 NAVD88) collected at EB12, which had exceedances of

both SVOCs and metals above the Track 2 RRSCOs. As such, the remedial elevation for the removal of contaminated material above the RRSCOs will be el 39 NAVD88 (between 7 and 10.5 feet bgs) across 84% of the Site, within the future cellar extents.

A Track 4 remedy would be completed for the 16% balance of the Site outside of the cellar footprint, which will be excavated for construction of the proposed loading dock and building foundation elements. Excavation for the construction of the composite cover system is anticipated to be completed to a depth corresponding to approximately 2 feet below current Site grade (corresponding to el 43 NAVD88). Non-hazardous contaminated material impacted with elevated concentrations of metals has been identified in this area and will be excavated, removed, and disposed of from approximately 16% of the Site footprint for construction of the composite cover system.

A SOE system will be constructed around the perimeter of the cellar excavation area to accommodate removal of soil to depths between 7 to 10.5 feet bgs (range due to variation in Site topography) for remedial excavation purposes. It should be noted that the SOE system will extend beyond the remedial excavation depth to development depths ranging from 13.5 to 23 feet bgs for construction of the cellar and associated pits and foundation elements. Should the results of soil confirmation sampling identify that Track 2 SCOs have not been achieved at the anticipated depths of 7 to 10.5 feet bgs, the remedial excavation will be extended until either the Track 2 SCOs have been achieved or the excavation has extended greater than 15 feet bgs.

The total estimated volume of material requiring removal and off-Site disposal for the combined Track 2 and Track 4 portion of the cleanup is approximately 3,400 CY. The estimated extent of the remedial excavation for Alternative II is shown on Figure 9.

3.2.3 UST System Removal

Although no subsurface metallic anomalies were identified during the 2020 geophysical survey or 2021 RI, the potential exists for USTs to be encountered during Site remediation as historical Site operations consisted of an at-grade asphalt-paved parking lot since at least 1950 and the Site has been classified as a garage/gasoline station.

Any USTs encountered during remedial excavation, will be decommissioned in accordance with applicable NYSDEC tank closure requirements, including DER-10 Section 5.5 and 6 NYCRR Part 612.2(d) and 613.9, and NYSDEC CP-51. USTs and/or associated appurtenances will be registered and administratively closed with the NYSDEC PBS unit. All excavation areas will be screened and inspected for the presence of petroleum-impacts to the surrounding soils.

Petroleum-impacted soil, if encountered, will be excavated, stockpiled separately, characterized, and disposed of off-Site at a permitted disposal facility in accordance with applicable regulations. If the remedial or development excavation does not extend beyond the bottom of the encountered tank, additional confirmation soil samples will be collected as described below.

Following removal of UST(s), affidavits of closure will be submitted to the FDNY, and PBS registration/de-registration applications will be submitted to NYSDEC if one or more tank systems store a combined capacity of more than 1,100 gallons or more of petroleum in aboveground and/or underground storage tanks; or one or more underground tank systems that are designed to store 110 or more gallons of petroleum.

3.2.4 Confirmation and Documentation Soil Sampling

Confirmation soil samples will be collected from the base of the remedial excavation under the Track 2 remedy at a frequency of one per 900 square feet. Sidewall samples will not be collected from the site perimeter within the cellar footprint of the proposed building because excavation will extend across the Site footprint and SOE measures (e.g., sheeting and lagging) will preclude access to soil sidewalls. An estimated 12 confirmation soil samples (12 base samples within the cellar footprint), plus QA/QC samples, will be collected at the base of the Track 2 remedial excavation at el 39 NAVD88 (between 7 and 10.5 feet bgs) to confirm remedial performance and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane. If a confirmation soil sample does not meet the RRSCOs, additional sampling will occur in two-foot intervals down to the proposed development depth to determine if Track 2 can be achieved. If Track 2 SCOs cannot be achieved at the proposed development depth (particularly in the areas where the development elevation is el 32.5 NAVD88 corresponding to a depth of 13.5 feet bgs) and deeper excavation to at least 15 feet bgs is not deemed to be feasible, then that portion of the Site will be considered a part of the Track 4 cleanup. Over-excavation will not be completed within this Track 4 area and the concrete building slab would serve as a composite cover. If Track 2 SCOs cannot be achieved at locations in which the proposed development depth is greater than 15 feet bgs, a documentation sample will be collected at 15 feet bgs to document the material remaining in place prior to the construction of the proposed development.

Documentation soil samples will also be collected from the surface of the material remaining in place under the Track 4 remedy prior to construction of the composite cover at a frequency of one per 900 square feet and from the Site perimeter at a frequency of one per 30 linear-feet. An estimated 9 documentation soil samples (two base samples and seven sidewall samples), plus QA/QC samples, will be collected to document the condition of soil remaining at the Site after

remediation and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane.

In the event that unidentified USTs are discovered during site remedial activities, if the remedial or development excavation does not extend beyond the bottom of the encountered tank, five documentation samples will be collected from each excavation and will consist of one sample per excavation sidewall and a sample from each excavation base in accordance with the requirements of DER-10 Section 5.4(b)(5). Samples will be analyzed for Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane.

3.2.5 Reuse of Material

Soil excavated during the remedy may be reused if completed in accordance with Section 5.4.6. Reused soil must be non-hazardous and must meet the RRSCOs (refer to Table 4). Grossly-impacted soil will not be reused. Soil removed during implementation of the remedy or removed for grading or other purposes which meets the RRSCOs may be reused as necessary as backfill but will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. If soil reuse is proposed, a NYSDEC Request to Import/Reuse Fill or Soil form (Revised April 2023; provided in Appendix C) will be submitted to NYSDEC in advance of any reuse.

3.2.6 Excavation Backfill

To the extent backfill is necessary to restore and raise the Site grade to the development elevation needed for foundation construction or for the construction of the composite cover system, any imported backfill would comply with 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10, and Appendix 5.

Imported material for excavation backfill (if necessary) will consist of material that meets the RRSCOs, NYSDEC Sampling, Analysis, and Assessment of PFAS guidance (April 2023) and Part 360.13(f) requirements for acceptable fill material uses, or other acceptable fill material such as virgin stone from a quarry or RCA. If RCA is imported to the Site, it will come from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of RCA acquisition. RCA imported from compliant facilities will not require chemical testing, unless required by NYSDEC under its terms for operation of the facility. Imported RCA and virgin stone must be derived from recognizable and uncontaminated concrete (less than 10%

by weight passing through a No. 100 sieve). RCA is not acceptable for, and will not be used as, Site cover or drainage material.

A NYSDEC Request to Import/Reuse Fill or Soil form (Revised April 2023; provided in Appendix C) will be submitted to NYSDEC in advance of any import.

3.2.7 Site Cover

As part of any Track 4 portion of the remedy based on the final confirmation samples, a site cover system will be constructed in that portion of the Site. The site cover system will consist of the concrete-paved loading dock and/or a minimum of 2 feet of clean soil/fill. The cover system will serve for the protection of human health by preventing contact with residual contaminated Site soil.

Imported material for construction of Site cover will consist of fill that meets the lower of RRSCOs or Protection of Groundwater SCOs, NYSDEC Sampling, Analysis, and Assessment of PFAS guidance (April 2023) and Part 360.13(f) requirements for acceptable fill material uses, or other acceptable fill material such as virgin stone from a quarry. RCA is not acceptable for, and will not be used as, Site cover.

Following construction of the cover system, a land survey will be performed by a NYS-licensed surveyor. The survey will define the extent of the cover system subject to long-term management. A map showing the survey results will be included in the FER and an SMP.

3.2.8 Environmental Easement

An environmental easement will be recorded referencing Institutional Controls (ICs) and Engineering Controls (ECs) that are part of the selected remedy, which will be binding upon all subsequent owners and occupants of the property. The ICs will: 1) restrict the Site to restricted residential, commercial, or industrial uses, although land use is subject to local zoning laws; 2) restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDEC, NYSDOH, or NYCDOHMH; 3) require implementation of an NYSDEC-approved SMP; 4) require the completion and submission to the NYSDEC a periodic certification of ICs and ECs in accordance with Part 375; and 5) include a Soil Excavation Work Plan to manage future excavation of remaining contaminated on-Site soil. The ECs will be the Site cover system in the Track 4 area described in this RAWP.

3.2.9 Site Management Plan

The SMP will identify all use restrictions and ECs and long-term monitoring and maintenance requirements to ensure the ICs and/or ECs remain in place and are effective. The SMP will include, but may not be limited to:

1. An Excavation Work Plan which details the provisions for management of future excavations in areas of remaining contamination.
2. Descriptions of the provisions of the environmental easement including any land use, and/or groundwater use restrictions.
3. Provisions for the management and inspection of the identified ECs.
4. Maintaining Site access controls and NYSDEC notification.
5. The steps necessary for the periodic reviews and certification of the ICs and/or ECs.
6. A Monitoring Plan to assess the performance and effectiveness of the remedy. The Monitoring Plan will include, but may not be limited to, a schedule of monitoring and frequency of submittals to NYSDEC.
7. A provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion.

3.2.10 Green and Sustainable Remediation

An environmental footprint analysis was also completed for Alternative II using SiteWise™. The following components of the remedy were entered in the SiteWise™ model:

- Site preparation including removal of the current surface asphalt parking lot;
- The Track 2 remedy across 84% of the site;
- The Track 4 remedy across 16% of the site; and
- Long Term Monitoring for the Track 4 portion, only

The site preparation for the combined Track 2 and 4 remedy includes removal of the surface parking lot materials and a waste characterization investigation to allow for offsite disposal of contaminated soil, similarly to the investigation discussed in Section 3.1.6. For the purposes of completing the SiteWise™ analysis, we have assumed that the amount of contaminated soil to be characterized, excavated and disposed of for implementation of Alternative II is approximately 3,400 cubic yards, including 3,265 cubic yards from the Track 2 portion of the Site and 135 cubic yards from the Track 4 portion of the Site. The Combined Track 2 and 4 remedy includes the

excavation of this material, construction of an SOE system to facility the Track 2 contaminated soil removal, construction of the Site cover for the Track 4 remedy, and confirmation soil sampling. The Track 2/4 remedy is anticipated to be completed over 4 months. The Track 4 long term monitoring includes annual cap inspections for 10 years.

Using the above identified information, the SiteWise™ model estimated the following emissions and total energy usage for the implementation of a Combined Tracks 2 and 4 remedy:

Remedial Alternatives	Alt II - Track 2/4
GHG Emissions (metric ton)	171.58
Total energy Used (million British thermal units [MMBTU])	2,043.26
Total NOx Emissions (metric ton)	0.99
Total SOx Emissions (metric ton)	0.34
Total PM10 Emissions (metric ton)	0.18

Details regarding the inputs and outputs of the SiteWise™ model are provided in Appendix D.

3.3 Evaluation of Remedial Alternatives

The following is an evaluation of the proposed remedial alternatives based on the NYSDEC BCP remedy evaluation criteria listed below. The first two criteria are considered "threshold criteria", and the remaining criteria are "balancing criteria". A remedial alternative must meet the threshold criteria in order to be considered and evaluated further under the balancing criteria.

1. Protection of Human Health and Environment
2. Compliance with Standards Criteria and Guidance (SCGs)
3. Short-Term Effectiveness and Impacts
4. Long-Term Effectiveness and Permanence
5. Reduction of Toxicity, Mobility, or Volume
6. Implementability
7. Cost Effectiveness

8. Community Acceptance
9. Land Use
10. Potential Indirect Environmental Impact

3.3.1 Protection of Public Health and the Environment

Alternative I - This Alternative complies with the threshold criteria by eliminating pathways of exposure from on-Site contaminated media. Remediating the Site to Track 1 SCGs will result in the removal of all on-Site contaminated material above Unrestricted Use SCOs at depths ranging from approximately 5 to 9 feet bgs on the western portion of the Site and 7 to 13 feet bgs (to be confirmed as part of the PDI) on the remainder of the Site. Excavation across the entire Site footprint will be required to remove contaminated material above Unrestricted Use SCOs. Any encountered USTs will be decommissioned, removed and disposed off-Site, and petroleum-impacted material, if encountered, will be excavated and disposed off-Site. To the extent additional Track 1 SCO exceedances are present in the confirmation samples, then under this remedy additional excavation would occur until Track 1 SCOs were met. The RAOs for public health and environmental protection will be met through the removal of all contaminated source soil, which will eliminate possible ingestion, inhalation, or dermal contact.

Alternative II – This Alternative also complies with the criteria by eliminating pathways of exposure from on-Site contaminated media, however, the goal will be to achieve a Track 2 remedy for the vast majority of the Site up to 15 feet bgs and a managed Track 4 remedy on the western portion of the Site, leaving some contaminated material in place which would be addressed by the Site cover system, the EE, and the SMP. The future use of the currently identified Track 4 portion of the Site will be a loading dock, not an occupied building and if other areas of the Site only meet Track 4, the environment and future building occupants will be protected by implementing and enforcing soil management controls in these areas when needed during future Site excavation, maintaining the cover system and any other institutional and engineering controls deemed required by implementation of the SMP and through enforcement of the EE.

Encountered USTs will be decommissioned and RAOs for public health will be met through the construction of the Site-wide cover system which will eliminate possible ingestion, inhalation, or dermal contact.

Public health will be protected during remediation under both remedial alternatives by implementing and enforcing dust, odor, and organic vapor control and monitoring plans, procedures when needed.

3.3.2 Compliance with Standards, Criteria, and Guidance

Both Alternatives will be in compliance with all applicable standards, criteria, and guidance listed in Section 4.1.1 by removing a majority of on-Site sources of contamination to achieve the RAOs or through the use of long term Site Management controls. While implementing either remedy, protection of public health and the environment will be maintained by enforcing a Site-specific CHASP (Appendix E) and CAMP (Section 5.4.12 of the RAWP). Occupational Safety and Health Administration (OSHA) requirements for on-Site construction safety will be followed by Site contractors performing work.

3.3.3 Short-Term Effectiveness and Permanence

Alternative I - In the short-term, there will be increased truck traffic and operational noise levels associated with the transport of impacted material excavated to achieve Track 1 standards and the import of backfill required to bring the western portion of the Site to construction grade. Over-excavation may be required, which would prolong the short term project impacts.

Disposal of the excavated contaminated material will require about 300 20-cubic-yard trips (to be confirmed as part of the PDI) and importing material to backfill the excavation and raise Site grades to the development elevation will require up to about 35 20-cubic yard trips. Implementing the Alternative I concept will require approximately 5 months of effort (assuming normal work hours). Flaggers will be used to protect pedestrians at Site entrances and exits. Dust, odors, and/or organic vapor from the excavation and construction-related noise all need to be controlled during this period of time.

Alternative II – The combined Track 2 and Track 4 remedy is similar to Alternative I but the lower volume of excavated contaminated material will require only about 170 20-cubic-yard truck trips. No imported material other than what is proposed for the building subgrade should be required to backfill the excavation for the Alternative II remedy. Implementing the Alternative II remedy would also require approximately 4 months of effort (assuming normal work hours). Due to the shallower remedial excavation on the western portion of the Site under the Track 4 remedy, the need for SOE under Alternative II is limited to the cellar excavation in the Track 2 portion of the Site. The relatively smaller excavation volume required for construction will generate less exposure to dust, odors, and potential organic vapor from the excavation and will have a shorter duration of construction-related noise, relative to Alternative I.

Under both remedial alternatives, dust will be controlled by the on-Site application of water spray as needed and the truck inspection station to avoid off-Site tracking of soil. Engineering controls, such as slowing the pace of work, applying foam and/or dust suppressant, and/or covering portions of the excavation will be used to suppress odors/dust when required. Work will be modified or stopped according to the action levels defined in the CAMP. Short term impacts are generally similar between the Alternatives, but Alternative II will occur over a shorter duration than Alternative I.

3.3.4 Long-Term Effectiveness and Permanence

Alternative I – A Track 1 remedy will remove all soil exceeding Unrestricted Use SCOs. Groundwater in this area of New York City is not used for drinking water; therefore, the long term effectiveness of this remedy will eliminate risks and satisfy the objectives of this criterion. Because an EE and SMP will not be required for a Track 1 remedy, Article 141 of the NYSDOH code will be relied upon to prevent ingestion of groundwater, which prohibits potable use of groundwater without prior approval. Future Site use will be unrestricted; therefore, the long-term effectiveness of this remedy will eliminate environmental risks and satisfy the objectives of this criterion.

Alternative II – The risks associated with leaving contaminated soil in place will be minimized, because the Track 4 portion of the remedy will eliminate potential exposure pathways by removing the contaminated material beneath the proposed loading dock and building foundation elements to approximately 2 feet bgs and installing a Site cover system. Additionally, the Track 2 portion of the remedy will also remove contaminated material within the cellar footprint of the proposed building to a maximum depth of 15 feet. In addition, groundwater in this area of NYC is not used for drinking water. An EE and SMP will be put in place to maintain the ICs/ECs. An evaluation of the potential for soil vapor intrusion for any occupied buildings on the Site, including the implementation of actions recommended to address exposures related to soil vapor intrusion, will be performed. The long-term effectiveness of this remedy similarly mitigates environmental risks and satisfies the objectives of this criterion.

3.3.5 Reduction of Toxicity, Mobility, and Volume

Both remedial alternatives would permanently and significantly reduce the toxicity, mobility, and volume of contamination through removal of contaminated non-native/soil source material through excavation and off-Site disposal.

Implementation of Alternative I will remove all contaminated material through excavation and off-Site disposal to whatever depth Track 1 exceedances are present on the Site (to be confirmed as part of the PDI and confirmation endpoint sampling). Additionally, the deeper PFAS and metals hotspots will also be removed under Alternative I. Implementation of Alternative II will include removal of contaminated material to a maximum depth of 15 feet bgs within the extents of the cellar footprint of the proposed building to achieve a Track 2 remedy on this portion of the Site and to 2 feet bgs in the Track 4 area, and construction of a site cover system for the Track 4 portion of the remedy.

3.3.6 Implementability

Alternative I – The Track 1 remedy will consist primarily of excavation and backfilling with standard bucket excavators. The implementability of this remedy is high due to the availability of local contractors, personnel, and equipment suitable to working in a structurally challenging environment due to the frequency of this type of remediation in this region. If deeper contamination above Unrestricted Use SCOs is encountered below proposed remedial excavation depths and requires over-excavation to achieve a Track 1 cleanup, the additional costs and delays incurred to complete a Track 1 cleanup will have to be evaluated to determine if it is practical at the additional depths that may be required to achieve Track 1. Also to be considered will be the type of equipment, location of the contamination exceeding Track 1 Unrestricted Use SCOs, design of the SOE, and the risk of subsidence of adjacent properties. Additional coordination between trades may be required. Furthermore, the additional coordination and legal implications required to negotiate the additional SOE and excavation being completed in the loading dock area, which is subject to easements with the adjacent property owners, may impact the implementability of Alternative I and may delay construction. This alternative is considered feasible; however, due to the deeper excavation required, is more difficult to achieve as compared to Alternative II.

Alternative II – The technical feasibility of implementing the combined Track 2 and Track 4 Alternative II remedy is greater than that of Alternative I, as Alternative II will not require deeper excavation. This alternative will consist mostly of excavation and backfilling with standard bucket excavators, assuming the Track 2 portion of the Site can achieve the Track 2 remedy without any significant over-excavation. The implementability of this remedy is high due to the availability of local contractors, personnel, and equipment suitable to working in a structurally challenging environment due to the frequency of this type of remediation in this region. Additional coordination between trades may be required. This alternative is considered feasible.

3.3.7 Cost Effectiveness

Alternative I – Based on the assumptions detailed for Alternative I, the estimated remediation cost of a Track 1 Cleanup is about $3.0 million. Alternative I is more costly than Alternative II but it permanently remedies the contamination on-Site to the Unrestricted Use SCOs. However, the inclusion of a Track 1 cleanup in the future loading dock area provides an unnecessary level of cleanup for the area's intended use. In addition to the excavation and disposal costs associated with the Alternative I – Track I cleanup, significant additional legal and land development costs may be necessary to implement this alternative within the existing easement / loading dock area. As these potential costs are unknown they have not been included in the alternatives analysis; however, they would make Alternative I an even less cost effective remedy. Table 5 details the individual cost components used to arrive at this cost estimate.

Alternative II – Based on the assumptions detailed for Alternative II, the estimated cost of a combined Track 2 and Track 4 Cleanup is about $2.44 million. The excavation cost for this alternative is more reasonable since the Track 4 area will not require significant excavation; however, it will leave contamination in place that will require monitoring over the long term to determine if the composite cover system remained effective in its protectiveness of human health and the environment. Table 6 details the individual cost components used to arrive at this cost estimate.

3.3.8 Community Acceptance

Both remedial Alternatives are expected to be acceptable to the community because the potential exposure pathways to on-Site contamination will be addressed upon completion of the respective remedies. The selected remedy was subject to a 45-day public comment period and will incorporate substantive public comments before being approved.

3.3.9 Land Use

The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with both Alternatives.

3.3.10 Potential Indirect Environmental Impact of the Remedy

The total energy usage for Alternative II (2,043.26 MMbtus) is estimated to be approximately 11% less than usage for Alternative I (2,305.46 MMbtus).

Additionally, Alternative II would emit approximately 8% fewer metric tons of GHG, 31% fewer metric tons of SOx, and 37% fewer metric tons of PM; however Alternative II would emit 39% more metric tons of NOx. A summary of the SiteWise™ model energy usage estimates are provided below and details regarding the model inputs and outputs are provided in Appendix D.

Remedial Alternatives	Alt I - Track 1	Alt II - Track 2/4
GHG Emissions (metric ton)	186.97	171.58
Total energy Used (MMBTU)	2,305.46	2,043.26
Total NOx Emissions (metric ton)	0.60	0.99
Total SOx Emissions (metric ton)	0.50	0.34
Total PM10 Emissions (metric ton)	0.29	0.18

3.4 Selection of Preferred Remedy

Both alternatives will be protective of human health and the environment and meet the remedy selection criteria. Alternative II achieves all of the remedial action goals established for the redevelopment project, effectively reduces contaminant mobility, and is effective in the reduction of contaminant toxicity and volume. Alternative II is also more cost-effective although it requires the implementation of ICs across the Site and an EC on a portion of the Site; however, these controls should be easily implementable long term pursuant to an SMP and EE, which runs with the land. Alternative II will require some long-term Site management, engineering controls, and associated future costs.

Alternative I is also protective of human health and the environment and technically feasible; however, the added cost of an SOE in the western portion of the Site, additional coordination required due to the easements in this area, and the potential for over-excavation should Track 1 SCOs not be met are more challenging and cost-prohibitive and therefore is not an economically viable option. Additionally, Alternative I would require consumption of more fuel and generate more greenhouse gas emissions to implement the remedy compared to Alternative II.

Alternative II is the selected remedy. Figure 9 depicts the Alternative II cleanup plan.

3.4.1 Zoning

The Site is within a commercial zoning district (C6-1). The Owner applied for a Zoning amendment to change from a C6-1 district to a C6-6 district on the western half of the Block to a depth of 250 feet from Hanson Place, and from C6-1 to C6-4 on the eastern half of the Block to a depth of 330 feet from Hanson Place within the Special Downtown Brooklyn District. This zoning map amendment received a Negative Declaration and Statement of No Significant Effect on 3 May 2021 and was approved on 10 December 2021. As part of the City Environmental Quality Review (CEQR) rezoning process, an E-designation (E-616) was placed on Block 2111, Lot 40 for air quality, window wall attenuation and alternate ventilation, and hazardous materials.

Concurrent with the rezoning, special permits were approved in December 2021 to modify tower floor plate coverage, minimum distance between buildings, and yard regulations under ZR 101-82 and to waive specific off-street parking requirements for developments with income-restricted units under ZR 74-533.

3.4.2 Surrounding Property Uses

The surrounding land uses include two Brooklyn Academy of Music buildings, five residential buildings, a 41-story mixed-use residential/commercial building and associated generator, a three-story church building, and a 31-story mixed-use residential/ commercial building.

The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy.

3.4.3 Citizen Participation

The CPP is discussed in Section 4.1.9.

3.4.4 Environmental Justice Concerns

The Site is not located in a potential Environmental Justice area or in a Disadvantaged Community.

3.4.5 Land Use Designations

There are no federal or state land use designations.

3.4.6 Population Growth Patterns

The population growth patterns and projections support the proposed land use.

3.4.7 Accessibility to Existing Infrastructure

Prior to redevelopment, connections to existing municipal infrastructure elements will be disconnected. Upon completion of the proposed development, water and sewer service will be provided by NYC water and sewer utilities, electric services will be supplied by Consolidated Edison, and natural gas services will be supplied by National Grid. The property is nearby New York City subway and bus routes.

3.4.8 Proximity to Cultural Resources

City Landmarks located within 0.5 mile of the Site include:

- The Brooklyn Academy of Music Historic District from Fulton Street to Ashland Place between Lafayette Avenue and Hanson Place located on the Site;
- Fort Greene Historic District from Ashland Place to Vanderbilt Avenue between Myrtle Avenue and Hanson Place, located on the Site;
- Williamsburgh Savings Bank Building, located at 1 Hanson Place and adjacent to the south of the Site;
- The Brooklyn Academy of Music located at 30 Lafayette Avenue approximately 0.02 miles to the north of the Site;
- Atlantic Avenue Subway Station, located at the intersection of Flatbush Avenue and Hanson Place approximately 0.04 miles to the south of the Site;
- Baptist Temple, located at 360 Schermerhorn Street approximately 0.13 miles to west of the Site;
- Hanson Place Seventh Day Adventist Church, located at 127 South Portland Avenue approximately 0.17 miles east of the Site;
- Boerum Hill Historic District which is roughly bounded by Pacific, Wyckoff, Bergen, Nevins, Bond and Hoyt Streets, located 0.26 miles to the west of the Site;
- Park Slope Historic District which is roughly bounded by Park Place West, Berkeley Place, 15th Street, 6th Avenue, 7th Avenue, and Flatbush Avenue located 0.33 miles to the south of the Site;
- St. Casi'ir's Roman Catholic Church (now the Paul Robeson Theatre), located at 40 Greene Avenue approximately 0.34 miles to the east of the Site;
- St. Peter's Protestant Episcopal Church, located at 355 State Street approximately 0.37 miles northwest of the Site;

- Dime Savings Bank, located at 9 De Kalb Avenue approximately 0.38 miles northwest of the Site;
- Prospect Heights Historic District from Bergen Street to Prospect Place around Carlton Avenue, located 0.42 miles to the south of the Site; and
- Clinton Hill Historic District which is roughly bounded by Fulton & Downing Streets and Grand, Willoughby, and Vanderbilt Avenues located 0.47 miles to the east of the Site.

The proposed remedy is not anticipated to adversely impact these cultural resources.

3.4.9 Proximity to Natural Resources

Potential wetlands on or near the Site were evaluated by reviewing the National Wetlands Inventory and NYSDEC regulated wetlands. Based on these documents, no mapped wetlands are listed on or near the Site. The Gowanus Canal, which is the closest water body, is approximately 1/2-mile southwest of the Site.

3.4.10 Off Site Groundwater Impacts

Based on groundwater elevation data collected as part of the RI, groundwater has been determined to flow to the south/southwest towards the Gowanus Canal. Municipal water supply wells are not present in this area of New York City; therefore, groundwater from the Site cannot affect municipal water supply wells or recharge areas.

3.4.11 Proximity to Flood Plains

According to the National Flood Insurance Rate map for the City of New York published by the Federal Emergency Management (FEMA) (Community Panel No. 3604970211F, effective date September 5, 2007), the Site is located in Zone X, which is designated for areas determined to be outside the 0.2% annual chance of flood and in an area of minimal flood hazard.

3.4.12 Geography and Geology of the Site

The Site geology is described in Section 2.2 of this report.

3.4.13 Current Institutional Controls

An easement in the southwest corner of Lot 40 exists that provides the adjacent property (1 Hanson Place) access to its generator, which is also located on Lot 40. This generator easement area is excluded from the BCP Site. The BCP Site is subject to other easements providing 1 Hanson Place with access to the Site, including a loading area easement in the western portion of Lot 40. These easements will continue after redevelopment of the Site.

3.4.14 Climate Resiliency

A Climate Screening Checklist was completed for the Site as part of this remedial design. The Climate Screening did not indicate that a Climate Change Vulnerability Assessment was necessary. The Climate Screening Checklist is included in Appendix D.

3.5 Summary of Selected Remedial Actions

Alternative II, a combined Track 2 and Track 4 cleanup, and implementation of long-term institutional controls in the Track 4 portion of the Site, will include the following tasks:

- Green and Sustainable Remediation components as identified in Section 3.1.
- Development and implementation of a CHASP and CAMP for the protection of on-Site workers, community/residents, and the environment during remediation and construction activities.
- Construction of the support of excavation (SOE) system to facilitate the Track 2 remedial excavation.
- Excavation, stockpiling, off-Site transport, and disposal of all soil that exceeds the Track 2 RRSCOs as defined by 6 NYCRR Part 375-6.8(b) to el 39 NAVD88 (corresponding to between 7 and 10.5 feet bgs) across approximately 84% of the Site footprint within the Track 2 portion of the Site based on the 2015 SI and 2021 RI data and to el 43 NAVD88 (corresponding to 2 feet bgs) across the remaining 16% of the Site footprint for construction of a loading dock and building foundation elements within the Track 4 portion of the Site.
- Collection and analysis of: confirmation soil samples from the Track 2 portion of the Site at the remedial elevation of el 39 NAVD88 (between 7 and 10.5 feet bgs), in accordance with DER-10 to confirm if the Track 2 RRSCOs were achieved; documentation soil samples in the Track 2 portion of the Site where overall construction excavation depths are greater than 15 feet bgs and the Track 2 RRSCOs were not achieved in order to document any remaining exceedances that may be present below this depth; and documentation soil samples in the Track 4 portion of the Site to document soil quality remaining at the Site. If the results of the confirmation soil samples identify Track 2 RRSCO exceedances, additional samples will be taken in two-foot intervals down to the planned depth of soil excavation or 15 feet bgs to determine the depth at which Track 2 SCOs can be achieved.

- Importation and backfilling of remediated areas and placement of additional fill as necessary to raise the remedial excavations areas to development grade with material meeting the RRSCOs, recycled concrete aggregate (RCA), or virgin, native crushed stone in compliance with 6 NYCRR 375-6.7(d).
- Reuse of Site soil meeting the RRSCOs to backfill the excavation and/or establish design grades at the Site, as needed in compliance with NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10. A NYSDEC Request to Import/Reuse Fill or Soil form (Revised April 2023; provided in Appendix C) will be submitted to NYSDEC in advance of any proposed reuse action.
- As part of the Track 4 portion of the remedy, installation of a Site cover system, including the concrete-paved loading dock to prevent human exposure to remaining contaminated soil/fill.
- Completion of a survey to document the extents of the Track 2 remediation, the Track 4 remediation, and the Site cover system.
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site and prohibitions on sensitive Site uses, such as farming or vegetable gardening, to eliminate future exposure pathways.
- Recording of an EE to memorialize the remedial action and the engineering and institutional controls to ensure that future owners of the Site continue to maintain these controls as required.
- Establishment of an approved SMP to ensure long-term management of remaining contamination as required by the EE, including plans for: (1) engineering and institutional controls, (2) monitoring, (3) operation and maintenance, and (4) reporting.
- A provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion.

Remedial activities will be completed in accordance with this RAWP and the Department-issued Decision Document. Deviations from the RAWP and/or Decision Document will be promptly reported to the NYSDEC for approval and explained in the FER.

4.0 REMEDIAL ACTION PROGRAM

4.1 Governing Documents

The primary documents governing the remedial action are summarized in this section. Where referenced, copies of the full plan are provided in the appendices.

4.1.1 Standards, Criteria and Guidance

The following standards, criteria, and guidance are typically applicable to Remedial Action projects in New York State, and will be consulted and adhered to as applicable:

- 29 CFR Part 1910.120 – Hazardous Waste Operations and Emergency Response
- 6 NYCRR Part 371 – Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Subpart 373-4 – Facility Standards for the Collection of Household Hazardous Waste and Hazardous Waste from Conditionally Exempt Small Quantity Generators
- 6 NYCRR Subpart 374-1 – Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
- 6 NYCRR Subpart 374-3 – Standards for Universal Waste
- 6 NYCRR Part 375 – Environmental Remediation Programs
- 6 NYCRR Part 376 – Land Disposal Restrictions
- 6 NYCRR Part 750 –SPDES Permits
- CP-43 – CP on Groundwater Monitoring Well Decommissioning (December 2009)
- CP-51 – Soil Cleanup Guidance (2010)
- DER-10 – Technical Guidance for Site Investigation and Remediation (May 3, 2010)
- DER-23 – Citizen Participation Handbook for Remedial Programs (March 2010)
- DER-31 – Green Remediation (August 11, 2010; revised January 20, 2011)
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006)
- TOGS 1.1.1 – Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations

- Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs (April 2023)
- USEPA OSWER Directive 9200.4-17 – Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (December 1997)
- New York State Climate Act (2019)

4.1.2 Site Specific Construction Health & Safety Plan

The Remediation Engineer (RE) prepared a Site-specific CHASP, which is included as Appendix E. The CHASP will address Site-specific contaminants and will apply only to remedial and construction-related work on-Site. Contractors operating on the Site are required to adhere to their own plans that, at a minimum, meet the requirements of the CHASP. Remedial work performed under this plan will be in compliance with governmental requirements, including Site and worker safety requirements mandated by the Federal Occupational Safety and Health Administration (OSHA). The CHASP provides a mechanism for establishing on-Site safe working conditions, safety organization, procedures, and PPE requirements during implementation of the remedy. The CHASP meets the requirements of 29 CFR 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65). The CHASP includes, but is not limited to, the following components:

- Organization and identification of key personnel
- Training requirements
- Medical surveillance requirements
- List of Site hazards
- Excavation safety
- Work zone descriptions
- Personal safety equipment and protective clothing requirements
- Decontamination requirements
- Standard operating procedures
- Protective measure plan
- CAMP
- Safety Data Sheets

The Volunteer and associated parties preparing the remedial documents submitted to the State and those performing the construction work are responsible for the preparation of an appropriate CHASP and for the appropriate performance of work according to that plan and applicable laws.

The CHASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion. The Langan Site Safety Coordinator will be Lauren Kott. If required for Site workers, confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gasses. Langan personnel will not enter confined spaces.

4.1.3 Quality Assurance Project Plan

The RE has prepared a Quality Assurance Project Plan (QAPP) that describes the quality control components that will ensure that the proposed remedy accomplishes the remedial goals, remedial action objectives, and is completed in accordance with the design specifications. The QAPP is provided as Appendix F and includes:

- Responsibilities of key personnel and their organizations for the proposed remedy;
- Qualifications of the quality assurance officer;
- Sampling requirements including methodologies, quantity, volume, locations, frequency, acceptance and rejection criteria; and
- Description of the reporting requirements for quality assurance activities including weekly quality assurance review reports, periodic quality assurance and quality control audits, and other report and data submissions.

4.1.4 Construction Quality Assurance Plan

The RE has prepared the following Construction Quality Assurance Plan (CQAP) that describes the quality control components that will ensure that the proposed remedy accomplishes the remedial goals, remedial action objectives, and is completed in accordance with the design specifications. Because the remedy is being accomplished through building construction, the contractor and construction manager will have the primary responsibility to provide construction quality. A list of engineering personnel involved in implementation of the CQAP and procedures that will be carried out by the remedial engineering team are identified below. Project personnel resumes are provided in Appendix G.

The following project personnel are anticipated to implement the RAWP.

Remedial Engineer (RE):	Ronald D. Boyer, P.E.
Project Manager:	Jessica Friscia, P.E.
Langan Health & Safety Officer:	Tony Moffa, ASP, CHMM, COSS
Langan Site Safety Coordinator:	Lauren Kott, P.E.
Qualified Environmental Professional (QEP):	Christopher McMahon, CHMM
Field Team Leader:	Lauren Kott, P.E.
Quality Assurance Officer:	Joe Conboy

The QEP or RE will directly supervise field engineers, scientists, and geologists that will be on Site during the remedial action to monitor contractor activities compliance with this RAWP and to implement the CAMP (Section 5.4.12). Daily reports will be submitted to the NYSDEC and NYSDOH and will include reporting of any CAMP results that exceed the specified action levels.

The QEP or RE will directly supervise field engineers, scientists, and geologists who will meet with the Construction Superintendent on a daily basis to discuss the plans for that day and schedule upcoming activities. The field engineer/scientist/geologist will document remedial activities in the daily report. This document will be forwarded to the Field Team Leader on a daily basis and to the Project Manager and the RE on a weekly basis. Any particulate and/or organic vapor exceedances and corrective actions taken will be reported to NYSDEC and NYSDOH project managers, separate from Daily Reports, within 24 hours of occurring.

The QEP or RE will directly supervise field engineers, scientists and geologists who will screen the excavation with a PID during intrusive activities. PID readings will be noted in the record. PID readings that exceed action levels will be reported to the NYSDEC and NYSDOH in the daily reports. The field engineer/scientist/geologist will collect the post-excavation soil samples in accordance with this RAWP.

A photo log will be kept to document construction activities by still photos. The photo log may also be used to record activities recorded in the daily report.

The project field book will be used to document sample collection and how it corresponds to the RAWP. Observations, field and/or laboratory tests will be recorded in the project field book or on separate logs. Recorded field observations may take the form of notes, charts, sketches, or photographs.

The Field Team Leader will maintain the current field book and original field paperwork during the performance of work. The Project Manager will maintain the field paperwork after completion and will maintain all submittal document files.

4.1.5 Soil/Materials Management Plan

The RE has prepared a Soil/Materials Management Plan (SMMP), which includes detailed plans for managing soil/materials that are disturbed at the Site, including excavation, handling, storage, transport and disposal. It also includes controls that will be applied to these efforts to assure effective, nuisance-free performance in compliance with applicable federal, state and local laws and regulations. The SMMP is further described in Section 5.4.

4.1.6 Erosion and Sediment Control Plan

Erosion and sediment controls will be implemented as necessary. Best Management Practices (BMP) for soil erosion will be selected to minimize erosion and sedimentation off Site from the start of the remediation to the completion of development. Erosion and sediment control measures will be implemented as described in Section 5.4.10. A Stormwater Pollution Prevention Plan (SWPPP) is not necessary because the project will disturb less than 20,000 square-feet. Stormwater discharge, if required, will be to a combined sewer in accordance with the New York City generic sewer discharge permit. Additionally, the redevelopment of the Site will not result in an increase of impervious area greater than 5,000 square-feet.

4.1.7 Community Air Monitoring Program

A CAMP was prepared for the Site as identified in Section 6.0 the CHASP (Appendix E) and is further discussed in Section 5.4.12.

4.1.8 Contractor's Site Operations Plan

The RE will review plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and will confirm that the plans and submittals are in compliance with this RAWP. The RE is responsible for documenting that contractor and sub-contractor submittals for this remedial project are in compliance with this RAWP. Remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work associated with the remedial document.

4.1.9 Citizen Participation Plan (CPP)

Fact Sheets describing the Remedial Action proposed in the RAWP were distributed through DEC Delivers (NYSDEC's email listserv service) as well as paper mailings to local elected officials. Additional Fact Sheets will be distributed to parties on the Site Contact List to announce: 1) the start of remedial action; 2) the completion of the Remedial Action with a summary of the FER; and 3) the issuance of the Certificate of Completion for the Site.

No changes will be made to the approved Fact Sheets without written consent of the NYSDEC. Other information, such as brochures and flyers, will not be included with the Fact Sheet mailing. The CPP, dated 11 August 2020, is provided in Appendix H.

Document repositories have been established at the following locations and contain all applicable project documents:

Brooklyn Community Board No. 2
350 Jay Street, 8th Floor
Brooklyn, NY 11201
Phone: (718) 596-5410

Brooklyn Public Library – Pacific Branch
25 Fourth Avenue
Brooklyn, NY 11217
Phone: (718) 628-1531
Hours (Call to verify):

Monday, Wednesday, Friday	10:00 a.m. to 6:00 p.m.
Tuesday	1:00 p.m. to 8:00 p.m.
Thursday	10:00 a.m. to 8:00 p.m.
Saturday	10:00 a.m. to 5:00 p.m.
Sunday	Closed

Documents are also posted on the NYSDEC DECinfo Locator website (https://www.dec.ny.gov/data/DecDocs/C224306/).

4.1.10 Green Remediation Principles and Best Management Practices

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the

design, implementation, and Site management of the remedy as per DER-31. The major green and sustainable remediation (GSR) components are as follows:

- Installation of a vapor barrier membrane below the slab of the proposed building and along sidewalls of any subgrade foundation elements beneath occupied spaces as a green remediation component.
- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term
- Reducing direct and indirect greenhouse gases and other emissions
- Increasing energy efficiency and minimizing use of non-renewable energy
- Conserving and efficiently managing resources and materials
- Reducing waste, increasing recycling, and increasing reuse of materials that would otherwise be considered a waste
- Maximizing habitat value and creating habitat when possible
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development
- Additionally, to incorporate the GSR principles and techniques to the extent feasible in the future development at this Site, any future on-Site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

The remedy will include the implementation of several Best Management Practices (BMPs) related to these green remediation components, including but not limited to the following:

- Waste Generation
- Electrical Use
- Emissions
- Water Usage
- Land and/or Ecosystem

Waste Generation

Waste generation considers the management of waste associated with remedial activities and any waste reduction projects including, but not limited to, material reuse and recycling. Several waste streams will be generated during implementation of the remedy (e.g., soil, polyethylene sheets used for stockpile coverage and separating types of contamination, nitrile gloves for endpoint sampling, disposable sample ware, acetate liners from drilling operations, decontamination materials). When possible, an effort will made to minimize consumption/ generation of such materials. If possible, decontamination and reuse of applicable materials will be considered. Electronic methods of data collection (e.g., tablets) will also be used to reduce paper consumption when possible. Additionally, designated collection points for waste streams will be encouraged to be separated into single use items such as metal, plastics, and glass containers; compostable materials; paper and cardboard; and other items that may be recycled locally.

Electrical Energy Use

Energy usage considers the electricity usage needed for remediation activities. Energy will be required for charging equipment (e.g., PIDs, air monitoring equipment). Battery-powered equipment will be turned off when not in use to limit charging activities.

Emissions

Emissions tracking considers fuel usage for transportation of personnel to and from the site, trucks used for export of contaminated material or import of backfill material, equipment and laboratory sample couriers, and construction equipment. To reduce fuel usage, trucks and heavy machinery operators will be encouraged to reduce idling time and shut down vehicles or equipment when not in use. The contractor will also be encouraged to perform routine, on-time maintenance such as oil changes to improve fuel efficiency. When possible and pending availability, personnel will be considered based on their proximity to the Site and will be encouraged to take public transport. Equipment/sample deliveries and pickups will be consolidated to reduce transport needs.

Water Usage

Water usage considers sources of water for tasks such as decontamination, irrigation, etc. The public water supply will be used when water is required for decontamination activities or dust suppression. This will be required for effective implementation of the remedy and the protection

of human health. Water will only be consumed when necessary, and consumption will be in accordance with local regulations.

Land and/or Ecosystems

Land and/or ecosystems consider any disturbances and restoration of land and/or ecosystems as part of the implementation/operation of the remedy. The Site is currently an asphalt-paved parking lot. During implementation of the proposed remedy, the Site cover will be restored following remedial excavation and will require minimal to no maintenance. No ecosystems will be disturbed during construction.

Further, progress with respect to GSR metrics will be tracked during implementation of the remedial action and reported in the Final Engineering Report (FER), including a comparison to the goals established during the remedial design program. As part of this evaluation in the FER, the total cubic yards of soil removed as part of the remedy will be tracked. Bulk materials imported for the remedy will be tracked based on the bulk materials to be imported for the development. The ratio of the remedial excavation volume and/or sidewall surface area as compared to the development excavation volume and/or sidewall surface area will be used to determine the percentage of the bulk material quantities imported for the remedy only. Additionally, personnel mileage to and from the site for the remedy will be tracked based on the number of Langan personnel field days.

4.2 General Remedial Construction Information

4.2.1 Project Organization

This section presents the anticipated project organization and associated roles, including key personnel, descriptions of duties, and lines of authority in the management of the RAWP. Information regarding the organization/personnel and their associated responsibilities is provided below. An organization chart and resumes of key personnel involved in the Remedial Action are included in Appendix G.

4.2.2 Remedial Engineer

The RE for this project will be Ronald D. Boyer, P.E. The RE is a registered professional engineer licensed by the State of New York. The RE will have primary direct responsibility for implementation of the remedial program for the 130 Saint Felix Street Development Site. The RE will certify in the FER that the remedial activities were observed by Langan personnel under

his supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with the RAWP.

The RE will document the work of other contractors and subcontractors involved in aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, and implementation, construction of ECs, emergency spill response services, import of backfill material, and management of waste transport and disposal. The RE will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The RE will review pre-remedial plans submitted by contractors for compliance with this RAWP and will certify compliance in the FER. The RE will provide the certifications listed in the FER.

4.2.3 Remedial Action Construction Schedule

The remedial action construction schedule is discussed below in Section 11 and is provided in Appendix I. The NYSDEC will be promptly notified of proposed changes, delays and/or deviations to the schedule.

4.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings (NYCDOB) construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Volunteer of any variances issued by the NYCDOB. NYSDEC reserves the right to deny alternate remedial construction hours.

4.2.5 Site Security

The Site perimeter will be secured with gated, signed, plywood fencing with points of entry and exit in accordance with NYCDOB and New York City Department of Transportation (NYCDOT) permits and requirements. The purpose of the fencing is to limit Site access to authorized personnel, protect pedestrians from Site activities, and maintain Site security.

4.2.6 Traffic Control

Site traffic will be controlled through designated points of access. Access points will be continuously monitored and if necessary, a flagging system will be used to protect workers, pedestrians and authorized guests. Traffic will also adhere to applicable local, state, and federal laws.

4.2.7 Contingency Plan

Although no subsurface metallic anomalies were identified during the 2020 geophysical survey or 2021 RI, the potential exists for USTs to be encountered during Site remediation as historical Site operations consisted of an at-grade asphalt-paved parking lot since at least 1950 and the Site has been classified as a garage/gasoline station.

Contingency plans, as described below, have been developed to effectively deal with unexpected discoveries of additional contaminated media or USTs.

4.2.7.1 Discovery of USTs

As a contingency, if an unknown UST is discovered via exploratory test pit or excavation, it will be decommissioned in accordance with 6 NYCRR Part 612.2(d) and 613.9, and DER-10 Section 5.5. Once the tank and its contents are removed, post-excavation soil samples will be collected per the NYSDEC DER-10 requirements. If the remedial or development excavation does not extend beyond the bottom of the encountered tank, additional documentation soil samples will be collected as required and detailed in Section 3.2.3 and Section 5.2.1. If encountered, petroleum-contaminated soils will be removed. UST closure documentation, such as contractor affidavits, bills of lading for sludge disposal, and tank disposal receipts, will be provided as appendices in the FER.

Following removal of UST(s), affidavits of closure will be submitted to the FDNY, and PBS registration/de-registration applications will be submitted to NYSDEC if one or more tank systems store a combined capacity of more than 1,100 gallons or more of petroleum in aboveground and/or underground storage tanks; or one or more underground tank systems that are designed to store 110 or more gallons of petroleum.

4.2.7.2 Discovery of Additional Contaminated Soil

During remediation and construction activities, the soil will be continuously monitored by the RE's field representatives using a PID as well as visual and olfactory field screening techniques to identify additional soil that may not be suitable for the current disposal facility(ies). If discovered, this material will be segregated and sampled in accordance with disposal facility requirements. If the facility is not permitted to receive the suspect materials, the material will be disposed of off-Site at a permitted facility able to receive the material based on the characterization data.

Identification of unknown or unexpected contaminated media identified by screening during ground-intrusive Site work will be promptly communicated by phone and email to the NYSDEC Project Manager. These findings will be detailed in the daily reports and the subsequent monthly BCP progress report.

4.2.8 Worker Training and Monitoring

Worker training and monitoring will be conducted in accordance with the Site-specific CHASP, included as Appendix E.

4.2.9 Agency Approvals

The Volunteer has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The planned end use for the Site conforms to current zoning for the property as determined by New York City Department of Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

A list of all federal, state and local governmental permits, certificates or other approvals or authorizations that may be required to perform the remedial and development work include the following:

- NYCDOB New Building Permit;
- Landmarks Approval to the Landmarks Preservation Committee;
- MTA NYC Transit Approval;
- NYCDOT Vault Permit for Con Edison Vault; and
- NYCDEP Site Connection.

As the work is proposed to begin in in the second quarter of 2025, a complete list of permits is not available. If requested, a complete list of permits will be presented prior to the pre-construction meeting. This list will include a citation of the law, statute, or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the Final Engineering Report.

4.2.10 Pre-Construction Meeting with NYSDEC

Prior to the onset of construction, a meeting will be held between the NYSDEC, QEP and/or RE, Volunteer, Construction Manager, and Contractor to discuss project roles, responsibilities, and expectations associated with the NYSDEC-approved RAWP. Notice will be provided to the NYSDEC seven days prior to Site mobilization.

4.2.11 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included as Attachment G in the CHASP. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

4.2.12 Remedial Action Costs

The estimated cost of the Combined Tracks 2 and 4 Remedial Action is $2.44 million. An itemized and detailed summary of estimated costs for the remedy is provided in Table 6.

4.3 Site Preparation

4.3.1 Mobilization

Prior to commencing the remedial excavation, the Remediation Contractor will mobilize to the Site and prepare for remedial activities. Descriptions of mobilization and Site preparation activities may include the following:

- Identifying the location of all aboveground and underground utilities (e.g., power, gas, water, sewer, communications), equipment, and structures (as necessary to implement the remediation);
- Mobilizing necessary remediation personnel, equipment, and materials to the Site;
- Constructing one or more stabilized construction entrances consisting of nonhazardous material capped with a gravel roadway at or near the Site exit, which takes into consideration the Site setting and Site perimeter;
- Constructing an equipment decontamination pad for trucks, equipment, and personnel that come into contact with impacted materials during remedial activities;
- Installing erosion and sedimentation control measures, as necessary; and,
- Installing temporary fencing or other temporary barriers to limit unauthorized access to areas where remediation activities will be conducted.

4.3.2 Erosion and Sedimentation Controls

Since the planned earthwork activities will be below the adjacent sidewalk grade and there are no catch basins in the vicinity of the perimeter of the Site (see Appendix A for the Site survey), full-time erosion and sedimentation measures are not anticipated. Best management practices for soil erosion will be selected and implemented, as needed, to minimize erosion and sedimentation off Site.

4.3.3 Monitoring Well Decommissioning

Existing groundwater monitoring wells will be properly decommissioned in accordance with NYSDEC policy CP-43 Groundwater Monitoring Well Decommissioning Policy or during excavation as part of future foundation construction and will be documented in the FER.

4.3.4 Stabilized Construction Entrance(s)

A temporary gravel construction entrance and exit will be installed on-Site for all vehicles exiting the BCP Site. The entrances will be covered with gravel or RCA and graded so that runoff water will be directed back into the Site. Vehicles exiting construction areas will be cleaned using clean water or dry brushing to remove Site soil from the tires and undercarriages. The Contractor will protect and maintain the sidewalks and roadway at Site access and existing points. As discussed in Section 4.3.2, there are no catch basins in the vicinity of the perimeter of the Site.

4.3.5 Utility Marker and Easements Layout

The Owner and its contractors are solely responsible for identifying utilities that might be affected by the remedial work and implementation of all required, appropriate, or necessary health and safety measures under this RAWP. The Owner and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, state, or federal permits or approvals pertinent to such work that may be required to implement this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the Site has been investigated. It has been determined by the RE that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site.

4.3.6 Support-of-Excavation

Appropriate management of structural stability of on-Site or off-Site structures during remedial activities, including excavation, is the sole responsibility of the Owner and its contractors. The Owner and its contractors are solely responsible for safe execution of work performed under this RAWP. The Owner and its contractors must obtain the necessary local, state, or federal permits or approvals that may be required to perform work under this RAWP. Further, the Owner and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved RAWP. As excavation is anticipated across approximately 84% of the Site footprint for the Track 2 portion of the Site, SOE design down to depths of 10.5 feet bgs is anticipated to be a notable component of the remedy.

A SOE system will be constructed around the perimeter of the cellar excavation area to accommodate the remedial excavation of soil to depths between 7 to 10.5 feet bgs based on the current RI data (range due to variation in Site topography), plus deeper development-related excavation to depths ranging from 13.5 to 23 feet bgs for construction of the cellar and associated pits and foundation elements.

4.3.7 Equipment and Material Staging

The Contractor will notify the RE and the Volunteer, in writing with receipt confirmed, of pending Site mobilization at least 30 calendar days in advance. During mobilization, construction equipment will be delivered to the Site, temporary facilities constructed, and temporary utilities installed. The Contractor will place and maintain temporary toilet facilities within the work areas for use by all Site personnel. The contractor will provide drinking water for all Site personnel.

Contractor mobilization will not begin until after the pre-construction meeting is held with NYSDEC pursuant to a 7 day advance notice to NYSDEC.

4.3.8 Truck Wash and Inspection Station

An outbound-truck inspection station will be set up at or near the Site exit. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Any soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment. The Contractor is responsible for collecting any soil that is inadvertently tracked immediately off Site and returning the soil to the Site. As discussed in Section 4.3.2,

there are no catch basins in the vicinity of the perimeter of the Site, and all fluids will be managed in accordance with Sections 5.4.4 and 5.4.7.

4.3.9 Site Fencing

The Site perimeter will be further secured with gated, signed, plywood fencing. The purpose of the fencing is to limit Site access to authorized personnel, protect pedestrians from Site activities, minimize construction noise, and maintain Site security.

4.3.10 Demobilization

After remediation and construction is completed, the Contractor will be responsible for demobilizing labor, equipment, and materials not designated for off-Site disposal. The RE will document that the Contractor performs follow-up coordination and maintenance for the following activities:

- Removal of sediment and erosion control measures and disposal of materials in accordance with applicable rules and regulations
- Removal of remaining contaminated material or waste
- Equipment decontamination
- General refuse disposal

4.4 Reporting

Periodic reports and an FER will be submitted to the NYSDEC as required to document the remedial action. The Project RE responsible for certifying all reports will be an individual licensed to practice engineering in the State of New York. Ronald D. Boyer, P.E. of Langan, will have this responsibility. Should Mr. Boyer become unable to fulfill this responsibility, another suitably qualified Professional Engineer will take his place.

Daily and monthly reports will be included as appendices to the FER. In addition to the periodic reports and the FER, copies of the relevant contractor documents will be submitted to the NYSDEC.

4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers during on-Site remedial construction activities by noon of the next business day following the reporting period and will include:

- An update of progress made during the reporting day;
- A figure showing the location and type of work performed during the reporting day and previously on the site;
- Photographs showing the site conditions and examples of work conducted;
- Locations of work and quantities of material imported and exported from the Site;
- References to an alpha-numeric map for Site activities;
- A summary of complaints with relevant details (names, phone numbers);
- A summary of CAMP findings, including trigger action levels;
- All CAMP data, either included in the daily report or as a separate file; and,
- An explanation of notable Site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information; however, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

Daily Reports will reference the NYSDEC-assigned project number and include a description of daily activities keyed to an alpha-numeric map that identifies work areas. These reports will include a summary of air monitoring results, odor and dust problems and corrective actions, and complaints received from the public.

4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th day of the month following the reporting period and will include the following information, as well as the information required in the BCA:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e., tons of material exported and imported, etc.)
- Description of approved activity modifications, including changes of work scope and/or schedule
- Sampling results received following internal data review and validation, as applicable

- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays

- Tracking of GSR metrics, using the same assumptions discussed in Section 4.1.10.

4.4.3 Other Reporting

Photographs of remedial activities will be taken and submitted to the NYSDEC. Photographs will illustrate the remedial program elements and will be of acceptable quality. Representative photographs of the Site will be provided. Field photographs will be included in daily and monthly reports, as necessary, and a comprehensive photograph log will be included in the FER. Upon request, photographs will be submitted to the NYSDEC and NYSDOH Project Managers on CD or other acceptable electronic media. CDs will have a label and a general file inventory structure that separates photographs into directories and sub-directories according to logical Remedial Action components. A photograph log keyed to photo file ID numbers will be prepared to provide explanation for all representative photographs.

Progress with respect to GSR metrics will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the goals established during the remedial program. Regular updates to the metrics identified in our SiteWise™ model will be included.

The Climate Screening process and results will be documented in the form of a completed checklist and brief letter report in the FER. If the Climate Screening results indicate that a CVA is necessary, a complete CVA Report will be developed. The CVA Report will be included as an Appendix or Attachment in the FER.

Site record keeping for all remedial work will be appropriately documented. These records will be maintained on Site at all times during the project and will be available for inspection by NYSDEC and NYSDOH staff.

Any particulate and/or organic vapor exceedances and corrective actions taken will be reported to NYSDEC and NYSDOH project managers, separate from Daily Reports, within 24 hours of occurring.

4.4.4 Complaint Management Plan

The management plan for documenting complaints is detailed below.

Item	Description
Approach	Complaints regarding remediation or construction activities/operations to be minimized and mitigation measures implemented to reduce the incidence of complaints.
Objective	To manage environmental complaints from the community regarding construction or remediation.
Implementation Strategy/Mitigation Measures	All complaints will be documented on a complaint register. The register will be maintained as an ongoing record. The entry will include following information: • Time, date and nature of complaint; • Type of communication (telephone, letter, personal, etc.); • Name, contact address and contact number; • Response and investigation undertaken as a result of the complaint; and action taken and signature of responsible person. Each complaint will be investigated as soon as practical in relation to requirements.
Monitoring	A representative of the Volunteers or the RE will follow up on the complaint within two weeks of receipt to ensure it is resolved.
Reporting	Upon receipt of the complaint, the NYSDEC will be notified. Complaint resolutions will be documented in daily reports.
Corrective Action	Should an incident or failure to comply occur in relation to the management of environmental complaints, one or more of the following corrective actions will be undertaken as appropriate: • Conduct additional training of staff to handle environmental complaints; • Investigate why the environmental complaint was not addressed within the specified time frame; • Investigate complaint and action follow-up to results of investigation.

4.4.5 Deviations from the RAWP

Necessary deviations from the RAWP will be coordinated with the NYSDEC in advance. Notification will be provided to the NYSDEC by telephone/email for conditions requiring immediate action (e.g., conditions judged to be a danger to the surrounding community). Based

on the significance of the deviation, an addendum to this RAWP may be necessary and will include:

- Reasons for deviating from the approved RAWP
- Approval process to be followed for changes/editions to the RAWP
- Effect of the deviations on the overall remedy

5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

5.1 Soil Cleanup Objectives

The Soil Cleanup Objectives for the Site are the RRSCOs which are listed in Table 4.

Soil and materials management on-Site and off-Site will be conducted in accordance with the SMMP as described below.

5.2 Remedial Performance Evaluation

5.2.1 Sampling Frequency

Confirmation soil samples will be collected from the excavation base of the excavation under the Track 2 remedy at a frequency of one per 900 square feet. Sidewall samples will not be collected from the site perimeter within the cellar footprint of the proposed building because excavation will extend across the site footprint and SOE measures (e.g., sheeting and lagging) will preclude access to soil sidewalls. An estimated 12 confirmation soil samples (12 base samples within the cellar footprint), plus QA/QC samples, will be collected to confirm remedial performance and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane. If a confirmation soil sample at the stated remedial depths ranging from 7 to 10.5 feet bgs within the Track 2 area does not meet the RRSCOs, additional confirmatory soil sampling will occur in two-foot intervals down to a maximum depth of 15 feet bgs to achieve Track 2. If Track 2 SCOs cannot be achieved at el 32.5 NAVD88 (corresponding to a depth of 13.5 feet bgs) and deeper excavation to at least 15 feet bgs is not deemed to be feasible, then that portion of the Site will be considered a part of the Track 4 cleanup. Over-excavation will not be completed within this Track 4 area and the concrete building slab would serve as a Site cover.

Documentation soil samples will also be collected from the surface of the material remaining in place under the Track 4 portion of the Site prior to construction of the composite cover at a frequency of one per 900 square feet and from the base of the Site perimeter at a frequency of

one per 30 linear-feet to document that the site has achieved the Site Specific SCOs and document the contamination that will remain in place for the portion of the site that will be remediated to Track 4 standards. An estimated 9 documentation soil samples (2 base samples and seven base samples at the perimeter of the Track 4 area), plus QA/QC samples, will be collected to document the condition of soil remaining at the Site after remediation and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane. A figure depicting the proposed endpoint sample locations for the Track 2 and 4 areas is provided as Figure 10.

In the location of unidentified USTs, if the remedial or development excavation does not extend beyond the bottom of the encountered tank, five documentation samples will be collected from each excavation and will consist of one sample per excavation sidewall and a sample from each excavation base in accordance with the requirements of DER-10 Section 5.4(b)(5). Samples will be analyzed for Part 375 list of VOCs, SVOCs, PCBs, pesticides/herbicides, cyanide, metals including hexavalent and trivalent chromium, PFAS, and 1,4-dioxane.

In the event over-excavation or hotspot removal is deemed feasible, one sidewall soil sample will be collected for every 30 linear feet of sidewall for those areas.

5.2.1.1 Methodology

Confirmation and documentation soil samples will be collected to confirm remedial performance and/or to document the condition of soil remaining at the Site after remediation and will be analyzed for the Part 375 list of VOCs, SVOCs, PCBs, herbicides, pesticides, cyanide, metals including hexavalent and trivalent chromium, PFAS and 1,4-dioxane. Should additional soil sampling be deemed necessary (e.g., additional tank closure, unknown environmental condition through visual evidence of a remaining source, over-excavation of failed confirmation sample), confirmation sampling will be conducted in accordance with NYSDEC DER-10.

If a confirmation soil sample under the Track 2 remedy does not meet the RRSCOs, additional sampling will occur in two-foot intervals to determine if Track 2 can be achieved. If Track 2 SCOs cannot be achieved or is not deemed to be feasible, then that portion of the Site will be considered a part of the Track 4 cleanup. Over-excavation will not be completed within this Track 4 area and the concrete building slab would serve as a Site cover.

No off-Site excavation is required. The results will be presented in NYSDEC ASP Category B deliverable format.

5.2.1.2 Quality Assurance/Quality Control

Quality control procedures for documentation soil sampling are included in the QAPP (refer to Appendix F). Documentation analytical results will be provided in the NYSDEC's electronic data deliverable (EDD) format for EQuIS™. Guidance on the sampling frequency is presented in NYSDEC DER-10 Section 5.4.

The QA/QC procedures required by the NYSDEC Analytical Services Protocol (ASP) and SW-846 methods will be followed. This will include instrument calibration, standard compound spikes, surrogate compound spikes, and analysis of quality control samples. The laboratory will provide sample bottles, which will be pre-cleaned and preserved. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP will take precedence.

5.2.1.3 Data Usability Summary Reports

ASP Category B deliverables will be prepared for all remedial performance samples collected during implementation of this RAWP. Data Usability Summary Reports (DUSR) will be prepared by a qualified data validator and the findings will be reported in the FER.

5.2.1.4 Documentation Sampling Reporting and Electronic Data Deliverables

Analytical laboratories that analyze documentation soil samples, prepare results, and perform contingency sampling will be NYSDOH ELAP-certified laboratories. Documentation and endpoint soil sampling will be performed in accordance with NYSDEC DER-10 sample frequency requirements. Electronic data deliverables in the NYSDEC data deliverable format will be submitted to the NYSDEC as documented in Section 6.2 of the QAPP (Appendix F). The FER will provide a tabular and map summary of all documentation soil sample results with a comparison to the RRSCOs. Soil samples with concentrations of contaminants above the RRSCOs, if any, will be identified.

5.3 Estimated Material Removal and Backfill Quantities

The estimated volume of soil requiring removal and off-Site disposal for the combined Track 2 and Track 4 remedy is about 3,400 CY. Backfilling to return remediated areas back to development grade within the cellar footprint of the proposed building is not anticipated as the Track 2 remedial excavation is currently anticipated to be shallower than the required development depth. However, if necessary, backfill that meets the RRSCOs and the requirements outlined in Section 5.4.9 will be imported to the Site or on-Site material that meets the requirements of 5.4.6 will be reused at the Site. Supporting documentation for all imported

material or backfilling of existing on-Site material will be provided to the NYSDEC for approval prior to import or reuse.

5.4 Soil/Materials Management Plan

This section presents the approach to management, disposal, and reuse of soil, fill, and materials excavated from the Site. This plan is based on the current knowledge of Site conditions and will be augmented, as necessary, using additional confirmation data collected during remediation. A field engineer, scientist, or geologist, under the direction of the RE will monitor and document the handling and transport of contaminated material removed from the Site for disposal as a regulated solid waste. A field engineer, scientist, or geologist, under the direction of the RE, will assist the remediation contractor in identifying impacted materials during remediation, determining materials suitable for direct load out versus temporary on-Site stockpiling, selection of samples for waste characterization, if necessary, and determining the proper off-Site disposal facility. Separate stockpile areas will be constructed as needed for the various materials to be excavated or generated, with the intent to most efficiently manage and characterize the materials and to avoid comingling impacted materials with non-impacted soil.

Excavated material will be transported off-Site and disposed of at a facility permitted to accept the material. Excavated material not exceeding the lower of the RRSCOs and PGSCOs may be reused on-site for Site redevelopment, pending NYSDEC approval.

Non-hazardous, contaminated material that contains contaminants above the RRSCOs is anticipated to be encountered during remediation. This material will be excavated for the planned Track 2 remedy across approximately 84% of the Site footprint and in the remaining Track 4 area constituting 16% of the Site footprint to shallower depths. Confirmation soil samples will be collected after contaminated soil is removed to el 39 NAVD88 (or approximately 7 to 10.5 feet bgs) within the cellar footprint prior to any additional excavation necessary for development and documentation soil samples will be collected after 2 feet bgs of excavation in the Track 4 area to document soil quality remaining at the Site. Sidewall samples will not be collected from the perimeter of the Track 2 area because excavation will extend across the site footprint and SOE measures (e.g., sheeting and lagging) will preclude access to soil on the sidewalls. A proposed endpoint confirmation sample location plan is provided as Figure 10. As noted above, confirmation sampling will continue down in two-foot intervals if Track 2 SCOs have not been met at the remedial depth to a maximum remedial depth of 15 feet bgs to achieve the Track 2 remedy.

5.4.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed by an engineer, geologist, or scientist under the direct supervision of a P.E. or QEP during all remedial and development excavations into known or potentially contaminated material. Soil screening will be performed regardless of the time of year that invasive work is conducted and will take place during excavation and invasive work performed as part of the remedy and development-related construction performed prior to issuance of the Certificate of Completion, including, but not limited to, excavating for remediation, foundation construction, and utility work.

Screening will be performed by qualified environmental professionals. Resumes are provided in Appendix G for personnel responsible for field screening (i.e., those representing the RE) the excavation and other ground-intrusive work performed during remediation and development.

5.4.2 Stockpile Methods

Stockpiles will be constructed as necessary to separate and stage excavated material pending loading or characterization sampling. Stockpile areas will meet the following minimum requirements, including the temporary erosion and sediment control measures identified below:

- Separate stockpile areas will be constructed to avoid comingling materials of differing waste types. Where material of different waste types cannot be otherwise separated, excavated soil will be placed onto a minimum thickness of 6 mil low-permeability liner of sufficient strength and thickness to prevent puncture during use; separate stockpiles will be created where material types are different (e.g., petroleum-impacted material stockpiled in a contaminated soil area). The use of multiple layers of thinner liners is permissible.
- Equipment and procedures will be used to place and remove the soil that will minimize the potential to jeopardize the integrity of the liner.
- Stockpiles located at or above sidewalk grade will be covered at the designated times (see below) with minimum 6-mil plastic sheeting or tarps which will be securely anchored to the ground. Stockpiles will be routinely inspected and broken sheeting covers will be promptly replaced.
- Stockpiles will be covered upon reaching their capacity (i.e., about 1,000 CY) until ready for loading. Stockpiles that have not reached their capacity, whether active or inactive, will be covered at the end of each workday.

- Each stockpile will be encircled with silt fences and hay bales, as needed, to contain and filter particulates from rainwater that has drained off the soils and to mitigate the potential for surface water run-off.
- Stockpiles will be inspected at a minimum of once daily and after every storm event. Results of inspections will be recorded in a logbook, maintained at the Site, and made available for inspection by the NYSDEC.

5.4.3 Materials Excavation and Load Out

A field engineer, scientist, or geologist under the supervision of the RE will oversee all ground-intrusive work, the excavation and load-out of excavated material, and all other work performed under this RAWP.

The Volunteer and its contractors are solely responsible for safe execution of ground-intrusive and other remedial work performed under this RAWP. The Volunteer and its contractors are solely responsible for the identification of utilities and/or easements that might be affected by the work conducted under this RAWP.

Loaded vehicles leaving the Site will be appropriately lined (as needed), securely covered, manifested, and placarded in accordance with the appropriate federal, state, and local requirements, including applicable transportation requirements (i.e., New York State Department of Transportation [NYSDOT] and NYCDOT requirements). Trucks hauling historic fill material will not be lined unless free liquids are present or the material is grossly impacted.

A truck wash will be operated on Site. The RE will be responsible for documenting that outbound trucks will be washed at the truck wash, before leaving the Site until the remedial construction is complete. Locations where vehicles enter or exit the Site will be inspected daily for evidence of off-Site sediment tracking.

The RE will be responsible for documenting that egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during remediation and development. The remediation contractor will clean adjacent streets as necessary to maintain a clean condition with respect to Site-derived materials.

The Volunteer and associated parties preparing the remedial documents submitted to New York State, and the parties performing this work, are responsible for the safe performance of ground-intrusive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The Volunteer and associated parties will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this RAWP.

Remedial excavation areas are presented in Figure 9 . The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this Remedial Action Work Plan.

Mechanical processing of contaminated soil on-Site is prohibited unless otherwise approved by NYSDEC.

Primary contaminant sources (including, but not limited to, tanks and hotspots) identified during Site characterization, the RI, and implementation of the remedy will be located via field measurements to the nearest permanent structures or property lines. The information will be shown on maps to be included with the FER.

5.4.4 Materials Transport Off-Site

Transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded. The trucking entrance will be determined prior to the initiation of the remedy. Truck routes are shown on Figure 12. All trucks loaded with Site materials will exit the vicinity of the Site using only approved truck routes.

These routes are the most appropriate routes to and from the Site and take into account:

- Limiting transport through residential areas and past sensitive Sites
- Use of city mapped truck routes
- Prohibiting off-Site queuing of trucks entering the facility
- Limiting total distance to major highways
- Promoting safety in access to highways
- Overall safety in transport
- Community input (where necessary)

Trucks will be prohibited from excessive stopping and idling in the neighborhood outside of the Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during remediation and development.

To the extent possible, queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be minimized.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed of off-Site in an appropriate manner.

5.4.5 Materials Disposal Off-Site

Disposal facilities will be determined at a later date and will be reported to the NYSDEC Project Manager prior to off-Site transport and disposal of excavated material. Soil/fill/solid waste excavated and removed from the Site will be handled, transported and disposed in accordance with local, State (including 6 NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360.15 Registration Facility).

The following documentation will be obtained and reported by the RE for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms to applicable laws:

(1) A letter from the RE or BCP Volunteer to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the RE. The letter will include as an attachment a summary of all chemical data for the material being transported (including waste characterization data).

(2) A letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material.

These documents will be included in the FER.

Non-hazardous, contaminated soil transported off-Site will be handled, at a minimum, as a solid waste per 6 NYCRR Part 360. The Remedial Engineer is responsible for assuring material is properly characterized and determining the appropriate disposal methods based on the characterization results.

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the NYSDEC Division of Materials Management (DMM) to be Construction and Demolition (C&D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C&D processing facility without permit modifications only upon prior notification of NYSDEC DMM. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C&D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

The FER will include an accounting of the destination of material removed from the Site during implementation of the remedy, including excavated soil, contaminated soil, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of each material type must also include records and approvals for receipt of the material. This information will also be presented in a table to be included in the FER.

A "Bill of Lading" system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the FER. Hazardous wastes derived from the Site, if any, will be stored, transported, and disposed of in compliance with applicable local, state, and federal regulations.

Appropriately licensed haulers, in compliance with applicable local, state, and federal regulations, will be used to transport the material removed from this Site.

Waste characterization sampling will be performed exclusively for the purposes of off-Site soil disposal in a manner suitable to receiving facilities and in conformance with applicable federal, state and local laws rules and regulations and facility-specific permits. Sampling and analytical methods, sampling frequency, analytical results and QA/QC associated with waste characterization activities will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt. Waste characterization data will be used solely for complying with requirements for off-site disposal. Waste Characterization sampling cannot be utilized for:

- Delineating the extent of contamination required for remediation at a Site.
- Replacing or substituting data collected as part of Site Characterization and/or Remedial Investigation.
- Replacing or substituting confirmation or documentation sampling as described in NYSDEC DER-10, Section 5.4.
- To modify remedial decisions as formalized in a NYSDEC approved Decision Document or Record of Decision.

5.4.6 Materials Reuse On-Site

Soil excavated during the remedy may be reused on Site if the requirements in this section are met. Grossly-impacted soil will not be reused. Reused soil must be non-hazardous and must meet the RRSCOs (refer to Table 4). Soil removed during implementation of the remedy or removed for grading or other purposes which meets the lower of the RRSCOs and PGSCOs may be reused as backfill pending NYSDEC approval but will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site is prohibited for reuse on-Site. Material deemed unfit for reuse will be transported for off-Site disposal. The Remedial Engineer will ensure that procedures defined for materials reuse in this RAWP are followed and that unacceptable material will not remain on-Site.

A "Request to Import/Reuse Fill Material" form will be filed with the NYSDEC project manager for review and approval prior to material reuse on the site. A copy of the form is presented in Appendix C. Acceptable demolition material proposed for reuse on-Site, if any, will be sampled for asbestos.

Concrete crushing or processing on-Site is prohibited, unless NYSDEC has specifically approved on-site processing and reuse of acceptable demolition material.

5.4.7 Fluids Management

As discussed in Section 4.3.4, a temporary gravel construction entrance and exit will be installed on-Site for all vehicles exiting the BCP Site. The entrances will be covered with gravel or RCA and graded so that runoff water will be directed back into the Site. Stormwater that accumulates at the Site due to heavy rain will be allowed to evaporate unless its presence either interferes with construction progress or is a safety concern, at which point stormwater will be pumped to a container (e.g., frac tank) and disposed of off-site.

Due to the depth of groundwater, dewatering is not anticipated to be required for a combined Track 2 and Track 4 Site remediation.

All liquids to be removed from the Site will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations or discharged into the New York City sewer system through approval by NYCDEP.

Discharge of water generated during remedial construction to surface waters (i.e., a local pond, stream, river and/or storm sewer) is prohibited without a SPDES permit.

5.4.8 Demarcation

For the portion of the Site where the Track 4 remedy will be implemented, contaminated soil will be left on-Site and the concrete-paved loading dock will serve as a demarcation layer. A survey denoting the base and sidewalls of the excavation will also be required to distinguish the Track 2 and Track 4 remedy areas for the FER, the SMP, and Environmental Easement.

5.4.9 Backfill from Off-Site Sources

Materials proposed for import onto the Site will be approved by the RE and will be in compliance with the provisions in this RAWP prior to receipt at the Site. Imported soil/fill must meet the lower of the RRSCOs and PGSCOs as set forth in Table 375-6.8(b) of 6 NYCRR Part 375 and listed in Table 7 or be comprised of other acceptable fill material such as virgin, native stone from a quarry, or RCA from a NYSDEC registered or permitted C&D processing facility. Material from industrial Sites, spill Sites, other environmental remediation Sites, or other potentially contaminated Sites will not be imported to the Site. Solid waste will not be imported onto the Site.

The FER will include the following certification by the RE: "I certify that all import of soils from off-Site, including source evaluation, approval, and sampling, has been performed in a manner that is consistent with the methodology defined in the RAWP".

If RCA is imported to the Site, it will be from a NYSDEC-registered facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require chemical testing provided that it consists of recognizable and uncontaminated concrete or brick, with no more than 10% by weight passing through a No. 100 sieve. RCA is not acceptable for and will not be used as cover or drainage material or to fill areas beneath the groundwater table. Crushed virgin stone from a permitted mine or quarry may also be imported without chemical testing if sieve analysis shows no more than 10% by weight passing through a No. 100 sieve.

Imported soil will meet the RRSCOs. Non-compliant soils will not be imported to the Site. Clean fill will be segregated at a source/facility that is free of environmental contaminants. Qualified environmental personnel will collect representative samples at a frequency consistent with NYSDEC DER-10 Table 5.4(e)10 – Recommended Number of Soil Samples for Soil Imported To or Exported From a Site. The samples will be analyzed for Part 375 VOCs, SVOCs, pesticides/herbicides, PCBs, cyanide, metals including trivalent and hexavalent chromium and PFAS, and 1,4-dioxane by a NYSDOH ELAP-certified laboratory. Upon meeting these criteria, the certified-clean fill will be transported to the Site and segregated from impacted material, as necessary, on plastic sheeting until it is used as backfill.

Soils that meet 'general fill' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by the NYSDEC. The contents of this RAWP and NYSDEC approval of this RAWP should not be construed as an approval for this purpose.

A "Request to Import/Reuse Fill Material" form will be filed with the NYSDEC project manager for review and approval prior to import to the site. A copy of the form is presented in Appendix C.

Trucks entering the Site with imported soils will be secured with tight fitting covers.

5.4.10 Stormwater Pollution Prevention

As the majority of planned earthwork activities will be below the adjacent sidewalk grade and there are no catch basins in the vicinity of the perimeter of the Site (see Appendix A for the Site survey), full-time erosion and sedimentation measures are not anticipated. Best management practices for soil erosion will be selected and implemented, as needed, to minimize erosion and sedimentation off Site.

5.4.11 Contingency Plan

If USTs or other previously unidentified contaminant sources are found during on-Site remedial excavation or development-related construction, sampling will be performed on product, if encountered, and surrounding subsurface materials (e.g., soil, stone, etc.) in accordance with Section 5.2.1. Chemical analyses will be for full scan parameters (Part 375 VOCs, SVOCs, PCBs, pesticides, herbicides, cyanide, and metals including hexavalent and trivalent chromium,1,4-dioxane and PFAS). Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during ground-intrusive work will be promptly communicated by phone to the NYSDEC Project Manager. These findings will also be detailed in the daily reports and the subsequent monthly BCP progress report.

It is anticipated that a combined Track 2 and Track 4 cleanup will be achieved. SCOs for both the Track 2 and Track 4 cleanups are presented in Table 4.

5.4.11.1 Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the Volunteer will undertake the following steps for site preparedness prior to the event and response after the event.

Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from excavated areas, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and

fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to NYSDEC at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911.

Petroleum spills will be reported to NYSDEC within 2 hours of identification and consistent with State regulations. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed.

Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained as necessary.

If soil or fill materials are discharged off site to adjacent properties, property owners and NYSDEC will be notified, and corrective measure plan designed to remove and clean dislocated material will be submitted to NYSDEC and implemented following approval by NYSDEC and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of NYSDEC.

If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYSDEC's spill hotline at (800) 457-7362 within statutory defined timelines. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYSDEC.

Storm Response Reporting

A Site inspection report will be submitted to NYSDEC at the completion of Site inspection. An inspection report will be used for this purpose. Site conditions will be compared to the inventory of Site conditions and material performed prior to the storm event and significant differences will be noted. The Site inspection report will be sent to the NYSDEC project manager and will include the Site name, address, tax block and lot, site primary and alternate contact name and phone number.

Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the Site was dislocated and whether any of the soil left the Site; estimates of the volume of soil that left the Site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYSDEC; description of corrective actions; schedule for corrective actions.

This report should be completed and submitted to NYSDEC project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.4.12 Community Air Monitoring Plan

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined below.

The CAMP will include real-time, continuous monitoring for VOCs and particulates at the upwind and downwind perimeter of each designated work area when ground-intrusive work is in progress. Continuous monitoring will be required for all ground-intrusive work. Ground-intrusive work includes, but is not limited to, soil/fill excavation and handling and utility trenching.

CAMP monitoring of total VOC levels will be conducted using PIDs, and monitoring for particulates will be conducted using particulate sensors equipped with filters that can detect airborne particulates less than 10 microns in diameter (PM10). Monitoring for particulates and odors will be conducted during ground-intrusive work by a field engineer, scientist, or geologist under the supervision of the RE. The work zone is defined as the general area in which machinery is operating in support of remediation. A portable PID will be used to monitor the work zone and for periodic monitoring of total VOC levels during work such as soil sampling. The Site perimeter will be visually monitored for fugitive dust emissions.

The following actions will be taken based on total VOC levels measured:

- If total VOC levels exceed 5 ppm above background for the 15-minute average at the perimeter, work will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work will resume with continued monitoring.
- If total VOC levels at the downwind perimeter of the work zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work will resume provided that the total VOC level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/ commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.
- If the total VOC level is above 25 ppm at the perimeter of the hot zone, work will be shut down.

The following actions will be taken based on dust levels measured or visual dust observations:

- If the downwind particulate level is 100 μg/m^3 greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 μg/m^3 above the background level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 μg/m^3 above the background level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 μg/m^3 of the upwind level and in preventing visible dust migration.

Sustained concentrations of VOCs or PM10 will be reported to the NYSDEC and NYSDOH Project Managers and included in the daily report. Any particulate and/or organic vapor exceedances and corrective actions taken will be reported to NYSDEC and NYSDOH project managers, separate from Daily Reports, within 24 hours of occurring. In addition, a map showing the location of the downwind and CAMP station and work zone monitoring station will be included in the daily report.

5.4.13 Odor, Dust and Nuisance Control Plan

Dust, odor, and nuisance control will be accomplished by the remediation contractor as described in this section. The FER will include the following certification by the RE: "I certify that ground-intrusive work during remediation and development-related construction was conducted in accordance with dust and odor suppression methodology defined in the RAWP."

5.4.14 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site. Specific odor control methods to be used on a routine basis (if needed) will include application of foam suppressants or tarps over the odor or VOC source areas, if encountered. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the RE, who is responsible for certifying the FER. Application of odor controls is the responsibility of the Remedial Contractor at the direction of the RE.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using non-PFAS foams to cover exposed odorous soils or PFAS containing foams that will be remediated immediately after use. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (a) direct load-out of soils to trucks for off-Site disposal; (b) use of chemical odorants in spray or misting systems; and, (b) use of staff to monitor odors in surrounding neighborhoods.

Although not anticipated, where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

5.4.15 Dust Control Plan

A dust suppression plan that addresses dust management during ground-intrusive on-Site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated water distribution system or on-Site water truck for road wetting, or an alternate source with suitable supply and pressure for use in dust control.
- Stockpiles shall be maintained in accordance with Section 5.4.2.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-Site roads will be limited in total area to minimize the area required for water spraying.

5.4.16 Other Nuisances

A plan for rodent control will be developed and used by the remediation contractor during Site preparation (including clearing and grubbing) and during remedial work.

A plan for noise control will be developed and used by the remediation contractor during Site preparation and remedial work and will conform, at a minimum, to the NYCDEP noise control standards.

6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

Because residual contaminated soil will exist beneath the Site above the Unrestricted Use SCOs (soil) after the combined Track 2 and Track 4 remedy is complete, ECs and ICs are required in that area to protect human health and the environment. These ECs and ICs have been described throughout this RAWP and are described hereafter. Long-term management of EC/ICs and of residual contamination will be executed under a Site-specific Site Management Plan (SMP) that will be developed and included in the FER.

The FER will document the end point sample results on the Site in tabular and map form. This will include presentation of and exceedances of Unrestricted Use SCOs, Protection of Groundwater SCOs and Restricted Residential SCOs.

7.0 ENGINEERING CONTROLS

Following completion of the remedy, it is anticipated that the Site will achieve a combined Track 2 and Track 4 Restricted Residential remedy throughout the Site footprint. As such, long-term engineering controls will be required as part of the remedial action in the form of a Site cover system in the portion of the Site achieving a Track 4 cleanup.

7.1 Site Cover System

Exposure to residual contaminated soils will be prevented by an engineered, composite cover system that will be built on a portion of the Site during the Track 4 portion of the remedy. This composite cover system will be comprised of impervious cover such as the concrete-paved loading dock area and/or (if necessary, in any locations beneath the building where the Track 2 remedy is not achieved) the concrete building slab. The composite cover extents are depicted on Figure 11.

Green remediation BMPs evaluated for the design and installation of the cover system include:

- Design in ways that mimic rather than alter the Site's natural setting, to improve the cover's long-term performance and protect ecosystem services such as potable water, wildlife habitat, and carbon storage;
- Design a cover accounting for potential effects of climate change, which could involve changes in onsite soil development or increased vulnerability to flooding; and
- Use uncontaminated soil or sediment from onsite excavation instead of imported soil/sediment for the cover's frost prevention and erosion control layers; similarly, uncontaminated sand, gravel, and rocks from onsite instead of offsite areas may be used for drainage.

An Excavation Plan will be included in the SMP and will outline the procedures to be followed in the event that soil with contamination remaining beneath the Site-wide cover system is disturbed after the Remedial Action is complete. Maintenance of the composite cover system will be described in the SMP.

8.0 CRITERIA FOR COMPLETION OF REMEDIATION/TERMINATION OF REMEDIAL SYSTEMS

8.1 Site Cover System

The Site cover system is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

9.0 INSTITUTIONAL CONTROLS

After the Combined Track 2 and Track 4 remedy is complete, the Site will have contamination remaining in place. ECs to manage the residual contamination have been incorporated into the Track 4 portion of the remedy to render the final remedy protective of public health and the

environment. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and an SMP. These elements are described in this section.

A Site-specific Environmental Easement will be recorded with New York County to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all ECs and ICs placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

9.1 Environmental Easement

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination above Unrestricted Use SCOs is left on all or a portion of a BCP Site after the Remedial Action is complete. As the Site will have remaining contamination after completion of all Remedial Actions, an Environmental Easement is required. As part of this remedy, an Environmental Easement approved by NYSDEC will be filed and recorded with the New York City office of the City Register. The recorded Environmental Easement will be included in the FER.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with the NYC Office of the City Register before the Certificate of Completion can be issued by NYSDEC. A series of ICs are required under this remedy to implement, maintain and monitor these EC systems, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil and restricting the use of the Site to restricted residential, commercial, and industrial uses only. These ICs are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. ICs can, generally, be subdivided between controls that support ECs, and those that place general restrictions on Site usage or other requirements. ICs in both of these groups are closely integrated with the SMP, which provides all of the methods and procedures to be followed to comply with this remedy.

The ICs that support the ECs are:

- Compliance with the Environmental Easement by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required;
- All ECs must be operated and maintained as specified in the SMP;
- All ECs on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;
- Environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP;
- ECs may not be discontinued without an amendment or extinguishment of the Environmental Easement. The Environmental Easement may be extinguished only by release by the Commissioner of New York State Department of Environmental Conservation, or the Commissioner's designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

Adherence to these ICs for the Site is mandated by the Environmental Easement and will be implemented under the SMP (discussed in the next section).

The Controlled Property (the Site) will also have a series of ICs in the form of Site restrictions and requirements. The Site restrictions that apply to the Controlled Property are:

- Vegetable gardens and farming on the Controlled Property are prohibited;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose as approved by NYSDOH and NYSDEC;
- All future activities on the Controlled Property that will disturb residual contaminated material, if present, are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Controlled Property may be used for restricted residential and commercial or industrial use only, provided the long-term ECs and ICs included in the SMP are employed and in compliance with current zoning;

- The Controlled Property may not be used for a higher level of use, such as unrestricted or residential (as opposed to restricted residential) use without an amendment or extinguishment of this Environmental Easement;
- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This statement must be certified by an expert that the NYSDEC finds acceptable.

9.2 Site Management Plan

Site Management is the last phase of remediation. The SMP is submitted as part of the FER but will be written in a manner that allows its use as a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the SMP are performed.

The SMP must include methods to incorporate and track GSR. Measures should be taken to maintain a cost-effective, protective remedy that remains conscious of the Site's environmental footprint. At a minimum, the following will be assessed to the extent any of these activities occur post remediation: waste generation, energy usage, emissions, and water usage.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all ECs and ICs; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual); (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation, if applicable.

The SMP will include three plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; and (3) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation and the guidelines provided by NYSDEC. An evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including the implementation of actions recommended to address exposures related to soil vapor intrusion, will be performed.

Site management, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annual. The SMP will be based on the certifying period relative to the date of issuance of the COC. The first submission will be due 16 months after the issuance of the COC, and annually (or at another frequency as approved by NYSDEC) thereafter. No exclusions for handling of residual contaminated soils, if any is remaining on the Site, will be provided in the SMP. All handling of residual contaminated material, if any, will be subject to provisions contained in the SMP.

10.0 FINAL ENGINEERING REPORT

A FER will be submitted to the NYSDEC following implementation of the final remedy. The FER will be prepared in conformance with NYSDEC DER-10 and will include the following:

- Documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan;
- A comprehensive account of the locations and characteristics of material removed from the Site including the map(s) of each source, as necessary;
- As-built drawings for constructed elements, certifications, manifests, and bills of lading;
- A description of the changes to the remedy from the elements provided in the RAWP and associated design documents, if any;
- A tabular summary of performance evaluation sampling results and material characterization results and other sampling and chemical analyses performed as part of the remedy;
- Written and photographic documentation of remedial work performed under this remedy;
- An itemized tabular description of actual costs incurred during implementation of the remedy;

- If necessary, a thorough summary of remaining contamination and an explanation for why the material was not removed as part of the remedy. A table and a map that shows remaining contamination, with the exception of nickel, in excess of the Unrestricted Use and/or Site Specific SCOs will also be included;
- An accounting of the destination of material removed from the Site, including excavated contaminated soil, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with the disposal of material must also include records and approvals for receipt of the material;
- An accounting of the origin and chemical quality of each material type imported onto the Site.
- A discussion of the GSR practices/technologies employed throughout the remedial program. A final footprint analysis using a DER accepted model, and any tracking methods used through the construction including restoration activities, must also be included.

Before approval of the FER and issuance of a Certificate of Completion, the daily reports and monthly BCP progress reports must be submitted in digital form on electronic media (i.e., PDF).

10.1 Certifications

The following certification will appear in front of the FER Executive Summary. The certification will be signed by the P.E., Ronald D. Boyer, who is a NYS-licensed Professional Engineer. The certification will be appropriately signed and stamped. The certification will include the following statements:

I, Ronald D. Boyer, am currently a registered professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 130 Saint Felix Street Site, and I certify that the Remedial Action Work Plan dated [month day year] and Stipulations [if any] in a letter dated [month day year] was implemented and that all construction activities were completed in substantial conformance with the DER-approved Remedial Action Work Plan.

I certify that the data submitted to the Department with this Final Engineering Report demonstrates that the remediation requirements set forth in the Remedial Action Work Plan and in all applicable statutes and regulations have been or will be achieved in accordance with the time frames, if any, established for the remedy.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and/or any operation and maintenance requirements applicable to the Site are contained in an environmental easement created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded.

I certify that a Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by the Department.

I certify that the Site description presented in this Final Engineering Report is identical to the Site descriptions presented in the Brownfield Cleanup Agreement for the 130 Saint Felix Street Site.

I certify that the remedial activities were observed by qualified environmental professionals under my supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved.

I certify that the export of contaminated soil, fill, water, or other material from the property was performed in accordance with the Remedial Action Work Plan, and were taken to facilities licensed to accept this material in full compliance with all federal, state, and local laws.

I certify that import of soils from off-Site, including source approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan.

I certify that ground-intrusive work during remediation and development-related construction was conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan.

I certify that all documents generated in support of this report have been submitted in accordance with the DER's electronic submission protocols and have been accepted by the Department.

I certify that all data generated in support of this report have been submitted in accordance with the Department's electronic data deliverable and have been accepted by the Department.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

11.0 SCHEDULE

Implementation of this RAWP is anticipated to begin in the second quarter of 2025. Mobilization is expected to take about one to two weeks. Once mobilization is complete, remediation of the Site will continue. The preferred remedy, which will be implemented in accordance with this RAWP, is anticipated to take about nine months to complete. After completion of the remedy, a FER will be submitted to the NYSDEC for review and approval. The schedule is included in Appendix I.

12.0 REFERENCES

1. Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., Phase I Environmental Site Assessment, dated May 2015.
2. Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., Subsurface Investigation Report, dated June 2015.
3. Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., Remedial Investigation Work Plan, dated 17 December 2020.
4. Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., Remedial Investigation Report, dated 4 February 2022.
5. New York State Department of Health, Final Guidance for the Evaluation of Soil Vapor Intrusion in the State of New York, dated October 2006 and updated February 2024.
6. New York State Department of Environmental Conservation, Division of Environmental Remediation, Draft Brownfield Cleanup Program Guide, dated May 2004.
7. New York State Department of Environmental Conservation, Division of Environmental Remediation, Technical and Administrative Guidance Memorandum No. 4031 Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Waste Sites, dated October 27, 1989.

8. New York State Department of Environmental Conservation, Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated May 3, 2010; effective June 18, 2010.

9. New York State Department of Environmental Conservation, Part 375 of Title 6 of the New York Compilation of Codes, Rules, and Regulations, Effective December 14, 2006.

10. New York State Division of Water Technical and Operational Guidance Series (TOGS) (1.1.1) dated June 1998.

11. New York State Division of Water Technical and Operational Guidance Series (TOGS) 5.1.8 New York State Stormwater Management Design Manual, dated June 2008.

12. NOVA Geophysical Engineering, Geophysical Engineering Survey Report, dated 14 January 2020

13. United States Environmental Protection Agency, Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, "EPA/540/S-95/504, April 1996.

TABLES

Table 1A
Remedial Action Work Plan
Soil Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location Sample ID Laboratory ID Sample Date Sample Depth (feet bgs)	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	EB07 EB07_10-12 L1511932-01 5/30/2015 10-12	EB07 DUP01_053015 L1511932-06 5/30/2015 10-12	EB09 EB09_4.5-5.5 L1511932-02 5/30/2015 4.5-5.5	EB10 EB10_1-2 L1511932-03 5/30/2015 1-2	EB12 EB12_7-9 L1511932-04 5/30/2015 7-9	EB13 EB13_7-9 L1511932-05 5/30/2015 7-9	LSB-1 015_LSB1_0-2 L2120301-15 4/21/2021 0-2	LSB-1 016_LSB1_8-10 L2120301-16 4/21/2021 8-10	LSB-1 023_LSB1_40-42 L2121015-03 4/23/2021 40-42	LSB-2 009_LSB2_0-2 L2120301-09 4/21/2021 0-2	LSB-2 010_LSB2_8-10 L2120301-10 4/21/2021 8-10	LSB-2 025_LSB2_42-44 L2121234-01 4/26/2021 42-44	LSB-2 026_DUP2 L2121234-02 4/26/2021 42-44	LSB-3 005_LSB3_0-2 L2120301-05 4/21/2021 0-2	LSB-3 007_LSB3_13-15 L2120301-07 4/21/2021 13-15
Volatile Organic Compounds (mg/kg)																		
1,1,1,2-Tetrachloroethane	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
1,1,1-Trichloroethane	0.68	0.68	100	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00053 U	0.00055 U	0.00061 UJ	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
1,1,2,2-Tetrachloroethane	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
1,1,2-Trichloroethane	~	~	~	0.0015 UJ	0.0018 U	0.0024 UJ	0.0017 U	0.36 U	0.0018 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
1,1-Dichloroethane	0.27	0.27	26	0.0015 UJ	0.0018 U	0.0024 UJ	0.0017 U	*0.36* U	0.0018 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
1,1-Dichloroethene	0.33	0.33	100	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
1,1-Dichloropropene	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
1,2,3-Trichlorobenzene	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 UJ	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,2,3-Trichloropropane	~	~	~	0.0098 UJ	0.012 U	0.016 UJ	0.011 U	2.4 U	0.012 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,2,4,5-Tetramethylbenzene	~	~	~	0.0039 UJ	0.0048 U	0.0064 UJ	0.0045 U	0.081 J	0.0048 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,2,4-Trichlorobenzene	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,2,4-Trimethylbenzene	3.6	3.6	52	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	0.54 J	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,2-Dibromo-3-Chloropropane	~	~	~	0.0049 UJ	0.0061 UJ	0.0081 UJ	0.0057 UJ	1.2 UJ	0.0061 UJ	0.0032 U	0.0033 U	0.0037 U	0.0032 U	0.0036 U	0.0032 U	0.0032 U	0.003 U	0.0025 U
1,2-Dibromoethane (Ethylene Dibromide)	~	~	~	0.0039 UJ	0.0048 U	0.0064 UJ	0.0045 U	0.95 U	0.0048 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
1,2-Dichlorobenzene	1.1	1.1	100	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	*1.2* U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,2-Dichloroethane	0.02	0.02	3.1	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 UJ	*0.24* U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
1,2-Dichloropropane	~	~	~	0.0034 UJ	0.0042 U	0.0056 UJ	0.004 U	0.83 U	0.0042 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	8.4	52	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	0.29 J	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,3-Dichlorobenzene	2.4	2.4	49	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,3-Dichloropropane	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,4-Dichlorobenzene	1.8	1.8	13	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,4-Diethyl Benzene	~	~	~	0.0039 UJ	0.0048 U	0.0064 UJ	0.0045 U	0.2 J	0.0048 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
1,4-Dioxane (P-Dioxane)	0.1	0.1	13	0.098 UJ	*0.12* UJ	*0.16* UJ	*0.11* UJ	*24* UJ	*0.12* UJ	0.085 UJ	0.088 UJ	0.098 U	0.085 UJ	0.095 UJ	0.086 U	0.084 U	0.08 UJ	0.066 UJ
2,2-Dichloropropane	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
2-Chlorotoluene	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
2-Hexanone (MBK)	~	~	~	0.0098 UJ	0.012 UJ	0.016 UJ	0.011 UJ	2.4 UJ	0.012 UJ	0.011 U	0.011 U	0.012 UJ	0.011 U	0.012 U	0.011 UJ	0.01 UJ	0.01 U	0.0082 U
4-Chlorotoluene	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
4-Ethyltoluene	~	~	~	0.0039 UJ	0.0048 U	0.0064 UJ	0.0045 U	0.95 U	0.0048 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Acetone	0.05	0.05	100	0.0056 J	0.012 UJ	0.016 UJ	0.011 UJ	*2.4* U	0.012 UJ	0.011 U	0.011 U	0.012 UJ	0.011 U	0.012 U	0.011 UJ	0.01 UJ	0.01 U	0.0082 U
Acrylonitrile	~	~	~	0.0098 UJ	0.012 U	0.016 UJ	0.011 U	2.4 U	0.012 U	0.0043 U	0.0044 U	0.0049 U	0.0042 U	0.0048 U	0.0043 UJ	0.0042 UJ	0.004 U	0.0033 U
Benzene	0.06	0.06	4.8	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	*0.24* U	0.0012 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
Bromobenzene	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Bromochloromethane	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Bromodichloromethane	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
Bromoform	~	~	~	0.0039 UJ	0.0048 U	0.0064 UJ	0.0045 U	0.95 U	0.0048 U	0.0043 UJ	0.0044 UJ	0.0049 U	0.0042 UJ	0.0048 UJ	0.0043 U	0.0042 U	0.004 UJ	0.0033 UJ
Bromomethane	~	~	~	0.002 UJ	0.0024 UJ	0.0032 UJ	0.0023 U	0.48 UJ	0.0024 UJ	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Carbon Disulfide	~	~	~	0.0098 UJ	0.012 U	0.016 UJ	0.011 U	2.4 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.01 U	0.01 U	0.0082 U
Carbon Tetrachloride	0.76	0.76	2.4	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 UJ	0.0011 UJ	0.0012 UJ	0.0011 UJ	0.0012 UJ	0.0011 U	0.001 U	0.001 UJ	0.00082 UJ
Chlorobenzene	1.1	1.1	100	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
Chloroethane	~	~	~	0.002 UJ	0.0024 UJ	0.0032 UJ	0.0023 U	0.48 UJ	0.0024 UJ	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Chloroform	0.37	0.37	49	0.0015 UJ	0.0018 U	0.0024 UJ	0.0017 U	0.36 U	0.0018 U	0.0016 U	0.0016 U	0.0005 J	0.0016 U	0.0018 U	0.0016 U	0.00023 J	0.0015 U	0.0012 U
Chloromethane	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0043 U	0.0044 U	0.0049 U	0.0042 U	0.0048 U	0.0043 U	0.0042 U	0.004 U	0.0033 U
Cis-1,2-Dichloroethene	0.25	0.25	100	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Cis-1,3-Dichloropropene	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
Cymene	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Dibromochloromethane	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Dibromomethane	~	~	~	0.0098 UJ	0.012 U	0.016 UJ	0.011 U	2.4 U	0.012 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Dichlorodifluoromethane	~	~	~	0.0098 UJ	0.012 U	0.016 UJ	0.011 U	2.4 UJ	0.012 U	0.011 UJ	0.011 UJ	0.012 U	0.011 UJ	0.012 UJ	0.011 U	0.01 U	0.01 UJ	0.0082 UJ
Diethyl Ether (Ethyl Ether)	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Ethylbenzene	1	1	41	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Hexachlorobutadiene	~	~	~	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0043 U	0.0044 U	0.0049 U	0.0042 U	0.0048 U	0.0043 U	0.0042 U	0.004 U	0.0033 U
Isopropylbenzene (Cumene)	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
M,P-Xylene	~	~	~	0.00024 J	0.0024 U	0.0032 UJ	0.0023 U	0.3 J	0.0024 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Methyl Ethyl Ketone (2-Butanone)	0.12	0.12	100	0.0098 UJ	0.012 UJ	0.016 UJ	0.011 UJ	*2.4* U	0.012 UJ	0.011 UJ	0.011 UJ	0.012 UJ	0.011 UJ	0.012 UJ	0.011 UJ	0.01 UJ	0.01 UJ	0.0082 UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	~	~	~	0.0098 UJ	0.012 U	0.016 UJ	0.011 UJ	2.4 U	0.012 U	0.011 UJ	0.011 UJ	0.012 U	0.011 UJ	0.012 UJ	0.011 UJ	0.01 UJ	0.01 UJ	0.0082 UJ
Methylene Chloride	0.05	0.05	100	0.0098 UJ	0.012 U	0.016 UJ	0.011 U	*2.4* U	0.012 U	0.0053 U	0.0055 U	0.0061 U	0.0053 U	0.006 U	0.0053 U	0.0053 U	0.005 U	0.0041 U
Naphthalene	12	12	100	0.0049 UJ	0.0061 U	0.0043 J	0.0057 U	**53**	0.0061 U	0.0043 U	0.0044 U	0.0049 U	0.0042 U	0.0048 U	0.0043 U	0.0042 U	0.004 U	0.0033 U
n-Butylbenzene	12	12	100	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
n-Propylbenzene	3.9	3.9	100	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
o-Xylene (1,2-Dimethylbenzene)	~	~	~	0.002 UJ	0.0024 U	0.0032 UJ	0.0023 U	0.24 J	0.0024 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Sec-Butylbenzene	11	11	100	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Styrene	~	~	~	0.002 UJ	0.0024 U	0.0032 UJ	0.0023 U	0.48 U	0.0024 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
T-Butylbenzene	5.9	5.9	100	0.0049 UJ	0.0061 U	0.0081 UJ	0.0057 U	1.2 U	0.0061 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Tert-Butyl Methyl Ether	0.93	0.93	100	0.002 UJ	0.0024 U	0.0032 UJ	0.0023 U	0.48 U	0.0024 U	0.0021 U	0.0022 U	0.0024 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.002 U	0.0016 U
Tetrachloroethene (PCE)	1.3	1.3	19	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
Toluene	0.7	0.7	100	0.00025 J	0.0018 U	0.0024 UJ	0.0017 U	0.36 U	0.0018 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Total 1,2-Dichloroethene (Cis and Trans)	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Total Xylenes	0.26	1.6	100	0.00024 J	0.0024 U	0.0032 UJ	0.0023 U	**0.54** J	0.0024 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Total, 1,3-Dichloropropene (Cis And Trans)	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00053 U	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
Trans-1,2-Dichloroethene	0.19	0.19	100	0.0015 UJ	0.0018 U	0.0024 UJ	0.0017 U	*0.36* U	0.0018 U	0.0016 U	0.0016 U	0.0018 U	0.0016 U	0.0018 U	0.0016 U	0.0016 U	0.0015 U	0.0012 U
Trans-1,3-Dichloropropene	~	~	~	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Trans-1,4-Dichloro-2-Butene	~	~	~	0.0049 UJ	0.0061 UJ	0.0081 UJ	0.0057 UJ	1.2 U	0.0061 UJ	0.0053 U	0.0055 U	0.0061 U	0.0053 U	0.006 U	0.0053 U	0.0053 U	0.005 U	0.0041 U
Trichloroethene (TCE)	0.47	0.47	21	0.00098 UJ	0.0012 U	0.0016 UJ	0.0011 U	0.24 U	0.0012 U	0.00041 J	0.00055 U	0.00061 U	0.00053 U	0.0006 U	0.00053 U	0.00053 U	0.0005 U	0.00041 U
Trichlorofluoromethane	~	~	~	0.0049 UJ	0.0061 UJ	0.0081 UJ	0.0057 U	1.2 UJ	0.0061 UJ	0.0043 U	0.0044 U	0.0049 U	0.0042 U	0.0048 U	0.0043 U	0.0042 U	0.004 U	0.0033 U
Vinyl Acetate	~	~	~	0.0098 UJ	0.012 U	0.016 UJ	0.011 UJ	2.4 U	0.012 U	0.011 U	0.011 U	0.012 U	0.011 U	0.012 U	0.011 U	0.01 U	0.01 U	0.0082 U
Vinyl Chloride	0.02	0.02	0.9	0.002 UJ	0.0024 U	0.0032 UJ	0.0023 U	*0.48* UJ	0.0024 U	0.0011 U	0.0011 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.001 U	0.001 U	0.00082 U
Total BTEX	~	~	~	0.00049	ND	ND	ND	0.54	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total VOCs	~	~	~	0.00609	ND	0.0043	ND	54.651	ND	0.00041	ND	0.0005	ND	ND	ND	0.00023	ND	ND

Notes provided on Page 7.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Protection of Groundwater SCOs are underlined.
Concentrations aboveRestricted Use Restricted-Residential SCOs are shaded.

Table 1A
Remedial Action Work Plan
Soil Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location Sample ID Laboratory ID Sample Date Sample Depth (feet bgs)	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	EB07 EB07_10-12 L1511932-01 5/30/2015 10-12	EB07 DUP01_053015 L1511932-06 5/30/2015 10-12	EB09 EB09_4.5-5.5 L1511932-02 5/30/2015 4.5-5.5	EB10 EB10_1-2 L1511932-03 5/30/2015 1-2	EB12 EB12_7-9 L1511932-04 5/30/2015 7-9	EB13 EB13_7-9 L1511932-05 5/30/2015 7-9	LSB-1 015_LSB1_0-2 L2120301-15 4/21/2021 0-2	LSB-1 016_LSB1_8-10 L2120301-16 4/21/2021 8-10	LSB-1 023_LSB1_40-42 L2121015-03 4/23/2021 40-42	LSB-2 009_LSB2_0-2 L2120301-09 4/21/2021 0-2	LSB-2 010_LSB2_8-10 L2120301-10 4/21/2021 8-10	LSB-2 025_LSB2_42-44 L2121234-01 4/26/2021 42-44	LSB-2 026_DUP2 L2121234-02 4/26/2021 42-44	LSB-3 005_LSB3_0-2 L2120301-05 4/21/2021 0-2	LSB-3 007_LSB3_13-15 L2120301-07 4/21/2021 13-15
Semivolatile Organic Compounds (mg/kg)																		
1,2,4,5-Tetrachlorobenzene	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
1,2,4-Trichlorobenzene	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
1,2-Dichlorobenzene	1.1	1.1	100	0.21 U	0.22 U	0.93 U	0.37 U	*10* U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
1,3-Dichlorobenzene	2.4	2.4	49	0.21 U	0.22 U	0.93 U	0.37 U	*10* U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
1,4-Dichlorobenzene	1.8	1.8	13	0.21 U	0.22 U	0.93 U	0.37 U	*10* U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
1,4-Dioxane (P-Dioxane)	0.1	0.1	13	NA	NA	NA	NA	NA	NA	*0.13* U	0.029 U	0.029 U	0.028 U	0.03 U	0.027 U	0.027 U	0.029 U	0.026 U
2,4,5-Trichlorophenol	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 UJ	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
2,4,6-Trichlorophenol	~	~	~	0.13 U	0.13 U	0.56 U	0.22 U	6.1 U	0.11 U	0.53 U	0.12 U	0.11 UJ	0.11 U	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
2,4-Dichlorophenol	~	~	~	0.19 U	0.2 U	0.84 U	0.33 U	9.2 U	0.17 U	0.8 U	0.18 U	0.17 U	0.16 U	0.18 U	0.16 U	0.16 U	0.17 U	0.16 U
2,4-Dimethylphenol	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	3.8 J	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
2,4-Dinitrophenol	~	~	~	1 U	1 U	4.5 U	1.8 U	49 U	0.89 U	4.3 UJ	0.94 UJ	0.92 UJ	0.88 UJ	0.96 UJ	0.86 UJ	0.87 UJ	0.92 UJ	0.83 UJ
2,4-Dinitrotoluene	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
2,6-Dinitrotoluene	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 UJ	0.18 U	0.2 U	0.18 UJ	0.18 UJ	0.19 U	0.17 U
2-Chloronaphthalene	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
2-Chlorophenol	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
2-Methylnaphthalene	~	~	~	0.26 U	0.26 U	1.2	0.44 U	50	0.093 J	1.1 U	0.23 U	0.23 U	0.22 U	0.24 U	0.22 U	0.22 U	0.23 U	0.21 U
2-Methylphenol (o-Cresol)	0.33	0.33	100	0.21 U	0.22 U	*0.93* U	*0.37* U	*10* U	0.18 U	*0.89* U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
2-Nitroaniline	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 UJ	0.19 UJ	0.19 UJ	0.18 UJ	0.2 U	0.18 UJ	0.18 UJ	0.19 U	0.17 U
2-Nitrophenol	~	~	~	0.46 U	0.48 U	2 U	0.8 U	22 U	0.4 U	1.9 UJ	0.42 UJ	0.41 U	0.4 UJ	0.43 UJ	0.39 UJ	0.39 UJ	0.41 UJ	0.38 UJ
3 & 4 Methylphenol (m&p Cresol)	0.33	0.33	100	0.31 U	0.32 U	*1.3* U	*0.53* U	**8.1** J	0.27 U	*1.3* U	0.28 U	0.28 U	0.26 U	0.29 U	0.26 U	0.26 U	0.27 U	0.25 U
3,3'-Dichlorobenzidine	~	~	~	0.21 UJ	0.22 UJ	0.93 UJ	0.37 UJ	10 U	0.18 UJ	0.89 U	0.19 UJ	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
3-Nitroaniline	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
4,6-Dinitro-2-Methylphenol	~	~	~	0.56 U	0.57 U	2.4 U	0.96 U	27 U	0.48 U	2.3 U	0.51 U	0.5 U	0.48 UJ	0.52 UJ	0.47 UJ	0.47 UJ	0.5 UJ	0.45 UJ
4-Bromophenyl Phenyl Ether	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
4-Chloro-3-Methylphenol	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
4-Chloroaniline	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
4-Chlorophenyl Phenyl Ether	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
4-Nitroaniline	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
4-Nitrophenol	~	~	~	0.3 U	0.31 U	1.3 U	0.52 U	14 U	0.26 U	1.2 UJ	0.27 UJ	0.27 UJ	0.26 UJ	0.28 U	0.25 U	0.25 U	0.27 U	0.24 U
Acenaphthene	20	98	100	0.17 U	0.18 U	1.9	0.3 U	**58**	0.18	0.11 J	0.16 U	0.15 U	0.15 U	0.16 U	0.14 U	0.14 U	0.15 U	0.14 U
Acenaphthylene	100	107	100	0.17 U	0.18 U	2.2	0.3 U	42	0.15	0.71 U	0.16 U	0.15 U	0.15 U	0.16 U	0.14 U	0.14 U	0.15 U	0.14 U
Acetophenone	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Anthracene	100	1,000	100	0.13 U	0.13 U	5	0.22 U	**140**	0.46	0.53 U	0.12 U	0.11 U	0.11 U	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Benzo(a)anthracene	1	1	1	0.13 U	0.13 U	**17**	0.22 U	**270**	0.9	0.34 J	0.12 U	0.11 U	0.098 J	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Benzo(a)pyrene	1	22	1	0.17 U	0.18 U	**17**	0.3 U	**260**	0.84	0.26 J	0.16 U	0.15 U	0.098 J	0.16 U	0.14 U	0.14 U	0.15 U	0.14 U
Benzo(b)fluoranthene	1	1.7	1	0.13 U	0.13 U	**21**	0.22 U	**270**	1	0.4 J	0.12 U	0.11 U	0.13	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Benzo(g,h,i)Perylene	100	1,000	100	0.17 U	0.18 U	12	0.3 U	**180**	0.57	0.2 J	0.16 U	0.15 U	0.08 J	0.16 U	0.14 U	0.14 U	0.15 U	0.14 U
Benzo(k)fluoranthene	0.8	1.7	3.9	0.13 U	0.13 U	**7.9**	0.22 U	**190**	0.37	0.14 J	0.12 U	0.11 U	0.043 J	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Benzoic Acid	~	~	~	0.69 U	0.71 U	3 U	1.2 U	33 U	0.6 U	2.9 U	0.63 U	0.62 U	0.6 UJ	0.65 UJ	0.58 UJ	0.59 UJ	0.62 UJ	0.56 UJ
Benzyl Alcohol	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 UJ	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Benzyl Butyl Phthalate	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 UJ	0.18 UJ	0.19 U	0.17 U
Biphenyl (Diphenyl)	~	~	~	0.49 U	0.5 U	0.41 J	0.84 U	14 J	0.42 U	2 U	0.44 U	0.44 U	0.42 U	0.46 U	0.41 U	0.42 U	0.43 U	0.4 U
Bis(2-chloroethoxy) methane	~	~	~	0.23 U	0.24 U	1 U	0.4 U	11 U	0.2 U	0.96 U	0.21 U	0.21 U	0.2 U	0.22 U	0.19 U	0.2 U	0.2 U	0.19 U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	~	~	~	0.19 U	0.2 U	0.84 U	0.33 U	9.2 U	0.17 U	0.8 U	0.18 U	0.17 U	0.16 U	0.18 U	0.16 U	0.16 U	0.17 U	0.16 U
Bis(2-chloroisopropyl) ether	~	~	~	0.26 U	0.26 U	1.1 U	0.44 U	12 U	0.22 U	1.1 UJ	0.23 UJ	0.23 U	0.22 UJ	0.24 U	0.22 U	0.22 U	0.23 U	0.21 U
Bis(2-ethylhexyl) phthalate	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.12 J	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Carbazole	~	~	~	0.21 U	0.22 U	1.9	0.37 U	100	0.24	0.89 U	0.19 U	0.19 U	0.019 J	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Chrysene	1	1	3.9	0.13 U	0.13 U	**18**	0.22 U	**270**	0.91	0.41 J	0.12 U	0.11 U	0.13	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Dibenz(a,h)anthracene	0.33	1,000	0.33	0.13 U	0.13 U	**3.6**	0.22 U	**60**	0.15	*0.53* U	0.12 U	0.11 U	0.11 U	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Dibenzofuran	7	210	59	0.21 U	0.22 U	1.5	0.37 U	**71**	0.17 J	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Dibutyl phthalate	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Diethyl phthalate	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Dimethyl phthalate	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Dioctyl phthalate	~	~	~	0.21 UJ	0.22 UJ	0.93 UJ	0.37 UJ	10 U	0.18 UJ	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Fluoranthene	100	1,000	100	0.13 U	0.13 U	23	0.11 J	**600**	2.4	0.68	0.12 U	0.11 U	0.22	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Fluorene	30	386	100	0.21 U	0.22 U	1.6	0.37 U	**76**	0.2	0.093 J	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Hexachlorobenzene	0.33	3.2	1.2	0.13 U	0.13 U	*0.56* U	0.22 U	*6.1* U	0.11 U	*0.53* U	0.12 U	0.11 U	0.11 U	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Hexachlorobutadiene	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Hexachlorocyclopentadiene	~	~	~	0.61 UJ	0.63 UJ	2.6 UJ	1 UJ	29 UJ	0.53 UJ	2.5 U	0.56 U	0.55 U	0.53 UJ	0.57 UJ	0.51 U	0.52 U	0.54 UJ	0.5 UJ
Hexachloroethane	~	~	~	0.17 U	0.18 U	0.74 U	0.3 U	8.2 U	0.15 U	0.71 U	0.16 U	0.15 U	0.15 U	0.16 U	0.14 U	0.14 U	0.15 U	0.14 U
Indeno(1,2,3-cd)pyrene	0.5	8.2	0.5	0.17 U	0.18 U	**10**	0.3 U	**170**	0.48	0.2 J	0.16 U	0.15 U	0.073 J	0.16 U	0.14 U	0.14 U	0.15 U	0.14 U
Isophorone	~	~	~	0.19 U	0.2 U	0.84 U	0.33 U	9.2 U	0.17 U	0.8 U	0.18 U	0.17 U	0.16 U	0.18 U	0.16 U	0.16 U	0.17 U	0.16 U
Naphthalene	12	12	100	0.21 U	0.22 U	3.2	0.37 U	**110**	0.2	0.89 U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Nitrobenzene	~	~	~	0.19 U	0.2 U	0.84 U	0.33 U	9.2 U	0.17 U	0.8 U	0.18 UJ	0.17 U	0.16 U	0.18 U	0.16 U	0.16 U	0.17 U	0.16 U
n-Nitrosodi-N-Propylamine	~	~	~	0.21 U	0.22 U	0.93 U	0.37 U	10 U	0.18 U	0.89 U	0.19 UJ	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
n-Nitrosodiphenylamine	~	~	~	0.17 U	0.18 U	0.74 U	0.3 U	8.2 U	0.15 U	0.71 U	0.16 U	0.15 U	0.15 U	0.16 U	0.14 U	0.14 U	0.15 U	0.14 U
Pentachlorophenol	0.8	0.8	6.7	0.17 U	0.18 U	0.74 U	0.3 U	*8.2* U	0.15 U	0.71 U	0.16 U	0.15 U	0.15 U	0.16 U	0.14 U	0.14 U	0.15 U	0.14 U
Phenanthrene	100	1,000	100	0.13 U	0.13 U	16	0.22 U	**620**	2	0.67	0.12 U	0.11 U	0.16	0.12 U	0.11 U	0.11 U	0.11 U	0.1 U
Phenol	0.33	0.33	100	0.21 U	0.22 U	*0.93* U	*0.37* U	**3.9** J	0.18 U	*0.89* U	0.19 U	0.19 U	0.18 U	0.2 U	0.18 U	0.18 U	0.19 U	0.17 U
Pyrene	100	1,000	100	0.13 U	0.13 U	23	0.096 J	**480**	2	0.59	0.12 U	0.11 U	0.2	0.12 U	0.11 U	0.11 U	0.02 J	0.1 U

Notes provided on Page 7.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Protection of Groundwater SCOs are underlined.
Concentrations aboveRestricted Use Restricted-Residential SCOs are shaded.

Table 1A
Remedial Action Work Plan
Soil Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location Sample ID Laboratory ID Sample Date Sample Depth (feet bgs)	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	EB07 EB07_10-12 L1511932-01 5/30/2015 10-12	EB07 DUP01_053015 L1511932-06 5/30/2015 10-12	EB09 EB09_4.5-5.5 L1511932-02 5/30/2015 4.5-5.5	EB10 EB10_1-2 L1511932-03 5/30/2015 1-2	EB12 EB12_7-9 L1511932-04 5/30/2015 7-9	EB13 EB13_7-9 L1511932-05 5/30/2015 7-9	LSB-1 015_LSB1_0-2 L2120301-15 4/21/2021 0-2	LSB-1 016_LSB1_8-10 L2120301-16 4/21/2021 8-10	LSB-1 023_LSB1_40-42 L2121015-03 4/23/2021 40-42	LSB-2 009_LSB2_0-2 L2120301-09 4/21/2021 0-2	LSB-2 010_LSB2_8-10 L2120301-10 4/21/2021 8-10	LSB-2 025_LSB2_42-44 L2121234-01 4/26/2021 42-44	LSB-2 026_DUP2 L2121234-02 4/26/2021 42-44	LSB-3 005_LSB3_0-2 L2120301-05 4/21/2021 0-2	LSB-3 007_LSB3_13-15 L2120301-07 4/21/2021 13-15
Pesticides (mg/kg)																		
4,4'-DDD	0.0033	14	13	0.00206 U	0.00212 U	0.00225 U	0.00175 U	0.00188 U	0.00177 U	*0.00844* U	0.00185 U	0.00184 U	0.00177 U	0.00188 U	0.00175 U	0.00168 U	0.0018 U	0.00167 U
4,4'-DDE	0.0033	17	8.9	0.00206 U	0.00212 U	0.00225 U	0.00175 U	0.00188 U	0.00177 U	*0.00844* U	0.00185 U	0.00184 U	0.00177 U	0.00188 U	0.00175 U	0.00168 U	0.0018 U	0.00167 U
4,4'-DDT	0.0033	136	7.9	*0.00386* UJ	*0.00397* UJ	*0.00422* UJ	0.00328 UJ	*0.00352* UJ	*0.00332* UJ	*0.0158* U	*0.00347* U	*0.00344* U	*0.00331* U	*0.00353* U	0.00328 U	0.00316 U	*0.00337* U	0.00313 U
Aldrin	0.005	0.19	0.097	0.00206 U	0.00212 U	0.00225 U	0.00175 U	0.00188 U	0.00177 U	*0.00844* U	0.00185 U	0.00184 U	0.00177 U	0.00188 U	0.00175 U	0.00168 U	0.0018 U	0.00167 U
Alpha BHC (Alpha Hexachlorocyclohexane)	0.02	0.02	0.48	0.000858 U	0.000882 U	0.000937 U	0.00073 U	0.000782 U	0.000739 U	0.00352 U	0.000772 U	0.000765 U	0.000737 U	0.000785 U	0.000729 U	0.000702 U	0.000748 U	0.000696 U
Alpha Chlordane	0.094	2.9	4.2	0.00258 U	0.00264 U	0.00281 U	0.00219 U	0.00234 U	0.00222 U	0.0105 U	0.00231 U	0.00229 U	0.00221 U	0.00235 U	0.00219 U	0.00211 U	0.00224 U	0.00209 U
Alpha Endosulfan	2.4	102	24	0.00206 U	0.00212 U	0.00225 U	0.00175 U	0.00188 U	0.00177 U	0.00844 U	0.00185 U	0.00184 U	0.00177 U	0.00188 U	0.00175 U	0.00168 U	0.0018 U	0.00167 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.09	0.36	0.00206 U	0.00212 U	0.00225 U	0.00175 U	0.00188 U	0.00177 U	0.00844 U	0.00185 U	0.00184 U	0.00177 U	0.00188 U	0.00175 U	0.00168 U	0.0018 U	0.00167 U
Beta Endosulfan	2.4	102	24	0.00206 U	0.00212 U	0.00225 U	0.00175 U	0.00188 U	0.00177 U	0.00844 U	0.00185 U	0.00184 U	0.00177 U	0.00188 U	0.00175 U	0.00168 U	0.0018 U	0.00167 U
Chlordane (alpha and gamma)	~	~	~	0.0167 U	0.0172 U	0.0183 U	0.0142 U	0.0152 U	0.0144 U	0.0703 U	0.0154 U	0.0153 U	0.0147 U	0.0157 U	0.0146 U	0.014 U	0.015 U	0.0139 U
Delta Bhc (Delta Hexachlorocyclohexane)	0.04	0.25	100	0.00206 UJ	0.00212 UJ	0.00225 UJ	0.00175 UJ	0.00188 UJ	0.00177 UJ	0.00844 U	0.00185 U	0.00184 U	0.00177 U	0.00188 U	0.00175 U	0.00168 U	0.0018 U	0.00167 U
Dieldrin	0.005	0.1	0.2	0.00129 U	0.00132 U	0.0014 U	0.00109 U	0.00117 U	0.00111 U	*0.00527* U	0.00116 U	0.00115 U	0.0011 U	0.00118 U	0.00109 U	0.00105 U	0.00112 U	0.00104 U
Endosulfan Sulfate	2.4	1,000	24	0.000858 UJ	0.000882 UJ	0.000937 UJ	0.00073 UJ	0.000782 UJ	0.000739 UJ	0.00352 U	0.000772 U	0.000765 U	0.000737 U	0.000785 U	0.000729 U	0.000702 U	0.000748 U	0.000696 U
Endrin	0.014	0.06	11	0.000858 UJ	0.000882 UJ	0.000937 UJ	0.00073 UJ	0.000782 UJ	0.000739 UJ	0.00352 U	0.000772 U	0.000765 U	0.000737 U	0.000785 U	0.000729 U	0.000702 U	0.000748 U	0.000696 U
Endrin Aldehyde	~	~	~	NA	NA	NA	NA	NA	NA	0.0105 U	0.00231 U	0.00229 U	0.00221 U	0.00235 U	0.00219 U	0.00211 U	0.00224 U	0.00209 U
Endrin Ketone	~	~	~	0.00206 U	0.00212 U	0.00225 U	0.00175 U	0.00188 U	0.00177 U	0.00844 U	0.00185 U	0.00184 U	0.00177 U	0.00188 U	0.00175 U	0.00168 U	0.0018 U	0.00167 U
Gamma Bhc (Lindane)	0.1	0.1	1.3	0.000858 U	0.000882 U	0.000937 U	0.00073 U	0.000782 U	0.000739 U	0.00352 U	0.000772 U	0.000765 U	0.000737 U	0.000785 U	0.000729 U	0.000702 U	0.000748 U	0.000696 U
Gamma Chlordane	~	~	~	0.00258 U	0.00264 U	0.00281 U	0.00219 U	0.00234 U	0.00222 U	0.0105 U	0.00231 U	0.00229 U	0.00221 U	0.00235 U	0.00219 U	0.00211 U	0.00224 U	0.00209 U
Heptachlor	0.042	0.38	2.1	0.00103 U	0.00106 U	0.00112 U	0.000876 U	0.000938 U	0.000887 U	0.00422 U	0.000926 U	0.000918 U	0.000884 U	0.000942 U	0.000875 U	0.000842 U	0.000898 U	0.000835 U
Heptachlor Epoxide	~	~	~	0.00386 U	0.00397 U	0.00422 U	0.00328 U	0.00352 U	0.00332 U	0.0158 U	0.00347 U	0.00344 U	0.00331 U	0.00353 U	0.00328 U	0.00316 U	0.00337 U	0.00313 U
Methoxychlor	~	~	~	0.00386 U	0.00397 U	0.00422 U	0.00328 U	0.00352 U	0.00332 U	0.0158 U	0.00347 U	0.00344 U	0.00331 U	0.00353 U	0.00328 U	0.00316 U	0.00337 U	0.00313 U
Toxaphene	~	~	~	0.0386 U	0.0397 U	0.0422 U	0.0328 U	0.0352 U	0.0332 U	0.158 UJ	0.0347 UJ	0.0344 U	0.0331 UJ	0.0353 UJ	0.0328 UJ	0.0316 UJ	0.0337 UJ	0.0313 UJ
Herbicides (mg/kg)																		
2,4,5-T (Trichlorophenoxyacetic Acid)	~	~	~	0.214 UJ	0.221 UJ	0.233 UJ	0.184 UJ	0.196 UJ	0.184 U	0.179 U	0.192 U	0.192 U	0.183 U	0.202 U	0.182 U	0.183 U	0.19 U	0.174 U
2,4-D (Dichlorophenoxyacetic Acid)	~	~	~	0.214 U	0.221 U	0.233 U	0.184 U	0.196 U	0.184 U	0.179 U	0.192 U	0.192 U	0.183 U	0.202 U	0.182 U	0.183 U	0.19 U	0.174 U
Silvex (2,4,5-Tp)	3.8	3.8	100	0.214 U	0.221 U	0.233 U	0.184 U	0.196 U	0.184 U	0.179 U	0.192 U	0.192 U	0.183 U	0.202 U	0.182 U	0.183 U	0.19 U	0.174 U
Polychlorinated Biphenyls (mg/kg)																		
PCB-1016 (Aroclor 1016)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
PCB-1221 (Aroclor 1221)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
PCB-1232 (Aroclor 1232)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
PCB-1242 (Aroclor 1242)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
PCB-1248 (Aroclor 1248)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
PCB-1254 (Aroclor 1254)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
PCB-1260 (Aroclor 1260)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
PCB-1262 (Aroclor 1262)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
PCB-1268 (Aroclor 1268)	~	~	~	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
Total PCBs	0.1	3.2	1	0.0421 U	0.044 U	0.0471 U	0.0362 U	0.0388 U	0.0364 U	0.035 U	0.0375 U	0.0375 U	0.0351 U	0.0388 U	0.0349 U	0.0368 U	0.038 U	0.0343 U
Inorganics (mg/kg)																		
Aluminum	~	~	~	7,100	9,800	6,200	6,100	5,800	7,800	4,580	7,080	1,760	7,070	6,580	1,740	1,760	7,170	3,920
Antimony	~	~	~	5.1 U	5.1 U	2.3 J	1.6 J	1.1 J	4.2 U	4.3 U	4.57 U	4.45 U	4.38 U	4.77 U	4.39 U	4.41 U	4.49 U	4.1 U
Arsenic	13	16	16	1.1	1.2	12	**16**	8.6	4.4	4.26	0.914 U	0.578 J	3.31	0.955 U	1.17	1.15	0.98	1.24
Barium	350	820	400	53	73	**860**	**370**	**720**	140	109	57.8	18.1	63.6	55.6	20.4	21.2	35.1	31.8
Beryllium	7.2	47	72	0.31 J	0.42 J	0.26 J	0.28 J	0.24 J	0.3 J	0.258 J	0.338 J	0.445 U	0.324 J	0.334 J	0.097 J	0.088 J	0.36 J	0.172 J
Cadmium	2.5	7.5	4.3	1 U	1 U	0.95 J	0.1 J	0.93	0.85 U	0.378 J	0.476 J	0.151 J	0.35 J	0.525 J	0.123 J	0.132 J	0.521 J	0.279 J
Calcium	~	~	~	1,300 J	1,700	45,000	26,000	22,000	14,000	29,400	1,810	4,390	30,400	1,510	4,370	4,980	5,550	6,680
Chromium, Hexavalent	1	19	110	0.58 J	0.53 J	0.96 J	0.31 J	0.33 J	0.3 J	0.876 U	0.944 U	0.927 U	0.89 U	0.984 U	0.888 U	0.892 U	0.936 U	0.852 U
Chromium, Total	~	~	~	18 J	25	24	16	32	17	10.6	20.8	5.2	11.8	20.3	3.83	5.52	20.2	11.1
Chromium, Trivalent	30	~	180	17 J	24 J	23 J	16 J	**32** J	17 J	11	21	5.2	12	20	3.8	5.5	20	11
Cobalt	~	~	~	6.6	8.6	4.7	5.5	4.7	5.6	4.56	8.32	2.23	4.96	8.32	2.23	2.77	7.36	6.24
Copper	50	1720	270	16	21	42	28	**64**	20	12.9	14.5	5.74	15.4	15.4	6.05	6.56	15	13.4
Cyanide	27	40	27	1.2 U	1.3 U	0.62 J	1.1 U	0.75 J	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	~	~	~	15,000	20,000	15,000	13,000	12,000	14,000	10,600	16,900	5,300	10,200	16,800	5,180	5,520	16,000	9,160
Lead	63	450	400	5.1 U	5.1 U	**2,800**	**620**	**2,000**	**130**	**169**	4.5 J	2.77 J	61.5	4.35 J	3 J	3.41 J	26.3	5.02
Magnesium	~	~	~	2,400 J	3,200	4,100	2,700	4,600	2,800	5,810	2,900	1,700	3,260	2,820	1,910	2,100	3,120	7,170
Manganese	1,600	2,000	2,000	370	380	390	250	260	270	224	358	149	220	348	139	165	296	199
Mercury	0.18	0.73	0.81	0.1 U	0.09 U	**0.9**	**0.25**	**1.7**	**0.42**	**0.186**	0.074 U	0.076 U	**0.191**	0.077 U	0.075 U	0.077 U	0.07 J	0.067 U
Nickel	30	130	310	15 J	16	16	13	20	13	9.85	14.6	5.85	18.2	16.2	4.97 J	9.07 J	13.3	**51.1**
Potassium	~	~	~	1,300	2,000	920	1,300	1,000	1,300	1,190	2,130	294	1,030	1,890	261	328	1,470	1,150
Selenium	3.9	4	180	2 U	2 U	0.75 J	0.4 J	1.3 J	0.53 J	0.327 J	1.83 U	1.78 U	0.333 J	1.91 U	1.76 U	1.76 U	1.8 U	1.64 U
Silver	2	8.3	180	1 U	1 U	0.72 J	0.86 U	0.21 J	0.85 U	0.86 U	0.914 U	0.89 U	0.876 U	0.955 U	0.878 U	0.881 U	0.899 U	0.821 U
Sodium	~	~	~	270	450	120 J	100 J	220	160 J	182	67.4 J	60.1 J	310	83.5 J	56.9 J	73.3 J	63.3 J	203
Thallium	~	~	~	2 UJ	2 U	2.2 U	1.7 U	1.8 U	1.7 U	1.72 U	1.83 U	1.78 U	1.75 U	1.91 U	1.76 U	1.76 U	1.8 U	1.64 U
Vanadium	~	~	~	24	33	22	22	32	25	20	28.8	5.97	21	27.7	5.98	7.97	29	16.8
Zinc	109	2,480	10,000	34 J	50	**1,200**	**510**	**620**	**140**	78	40.2	12.8	49.9	55.2	12.9	14.1	51.2	25.5
General Chemistry (%)																		
Total Solids	~	~	~	77.4	74.9	70.4	89.8	84.3	89.5	91.3	84.7	86.3	89.9	81.3	90.1	89.7	85.5	93.9

Notes provided on Page 7.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Protection of Groundwater SCOs are underlined.
Concentrations aboveRestricted Use Restricted-Residential SCOs are shaded.

Table 1A
Remedial Action Work Plan
Soil Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location Sample ID Laboratory ID Sample Date Sample Depth (feet bgs)	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	LSB-3 006_LSB3_20-22 L2120301-06 4/21/2021 20-22	LSB-4 003_LSB4_0-2 L2120301-03 4/21/2021 0-2	LSB-4 004_LSB4_8-10 L2120301-04 4/21/2021 8-10	LSB-4 008_LSB4_20-22 L2120301-08 4/21/2021 20-22	LSB-5 001_LSB5_0-2 L2120301-01 4/21/2021 0-2	LSB-5 017_DUP01_042121 L2120301-17 4/21/2021 0-2	LSB-5 002_LSB5_13-15 L2120301-02 4/21/2021 13-15	LSB-5 022_LSB5_42-44 L2121015-02 4/23/2021 42-44	LSB-6 011_LSB6_0-2 L2120301-11 4/21/2021 0-2	LSB-6 012_LSB6_13-15 L2120301-12 4/21/2021 13-15	LSB-6 021_LSB6_42-44 L2121015-01 4/23/2021 42-44	LSB-7 013_LSB7_0-2 L2120301-13 4/21/2021 0-2	LSB-7 014_LSB7_8-10 L2120301-14 4/21/2021 8-10	LSB-7 027_LSB7_42-44 L2121234-03 4/26/2021 42-44
Volatile Organic Compounds (mg/kg)																	
1,1,1,2-Tetrachloroethane	~	~	~	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.00067 U	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
1,1,1-Trichloroethane	0.68	0.68	100	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 UJ	0.00067 U	0.00048 U	0.00057 UJ	0.00051 U	0.00053 U	0.00053 U
1,1,2,2-Tetrachloroethane	~	~	~	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.00067 U	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
1,1,2-Trichloroethane	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethane	0.27	0.27	26	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethene	0.33	0.33	100	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
1,1-Dichloropropene	~	~	~	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.00067 U	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
1,2,3-Trichlorobenzene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,2,3-Trichloropropane	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,2,4,5-Tetramethylbenzene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,2,4-Trichlorobenzene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,2,4-Trimethylbenzene	3.6	3.6	52	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,2-Dibromo-3-Chloropropane	~	~	~	0.0028 U	0.0046 U	0.0031 U	0.0028 U	0.0044 U	0.0069 U	0.0032 U	0.0035 U	0.004 U	0.0029 U	0.0034 U	0.0031 U	0.0032 U	0.0032 U
1,2-Dibromoethane (Ethylene Dibromide)	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
1,2-Dichlorobenzene	1.1	1.1	100	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,2-Dichloroethane	0.02	0.02	3.1	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
1,2-Dichloropropane	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	8.4	52	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,3-Dichlorobenzene	2.4	2.4	49	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,3-Dichloropropane	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,4-Dichlorobenzene	1.8	1.8	13	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,4-Diethyl Benzene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
1,4-Dioxane (P-Dioxane)	0.1	0.1	13	0.075 UJ	*0.12* UJ	0.084 UJ	0.075 UJ	*0.12* UJ	*0.18* UJ	0.086 UJ	0.092 U	*0.11* UJ	0.077 UJ	0.091 U	0.082 UJ	0.084 UJ	0.085 U
2,2-Dichloropropane	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
2-Chlorotoluene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
2-Hexanone (MBK)	~	~	~	0.0093 U	0.015 U	0.01 U	0.0094 U	0.014 U	0.023 U	0.011 U	0.012 UJ	0.013 U	0.0097 U	0.011 UJ	0.01 U	0.01 U	0.01 UJ
4-Chlorotoluene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
4-Ethyltoluene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Acetone	0.05	0.05	100	0.011	0.015 U	0.01 U	0.0094 U	0.014 U	0.023 U	0.011 U	0.012 UJ	0.013 U	0.0097 U	0.011 UJ	0.01 U	0.01 U	0.01 UJ
Acrylonitrile	~	~	~	0.0037 U	0.0062 U	0.0042 U	0.0038 U	0.0058 U	0.0092 U	0.0043 U	0.0046 U	0.0053 U	0.0039 U	0.0045 U	0.0041 U	0.0042 U	0.0042 UJ
Benzene	0.06	0.06	4.8	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.00067 U	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
Bromobenzene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Bromochloromethane	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Bromodichloromethane	~	~	~	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.00067 U	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
Bromoform	~	~	~	0.0037 UJ	0.0062 UJ	0.0042 UJ	0.0038 UJ	0.0058 UJ	0.0092 UJ	0.0043 UJ	0.0046 U	0.0053 UJ	0.0039 UJ	0.0045 U	0.0041 UJ	0.0042 UJ	0.0042 U
Bromomethane	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Carbon Disulfide	~	~	~	0.0093 U	0.015 U	0.01 U	0.0094 U	0.014 U	0.023 U	0.011 U	0.012 U	0.013 U	0.0097 U	0.011 U	0.01 U	0.01 U	0.01 U
Carbon Tetrachloride	0.76	0.76	2.4	0.00093 UJ	0.0015 UJ	0.001 UJ	0.00094 UJ	0.0014 UJ	0.0023 UJ	0.0011 UJ	0.0012 UJ	0.0013 UJ	0.00097 UJ	0.0011 UJ	0.001 UJ	0.001 UJ	0.001 U
Chlorobenzene	1.1	1.1	100	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.00067 U	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
Chloroethane	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Chloroform	0.37	0.37	49	0.0014 U	0.0023 U	0.0016 U	0.0014 U	0.0022 U	0.0034 U	0.0016 U	0.0017 U	0.002 U	0.0014 U	0.00022 J	0.0015 U	0.0016 U	0.00034 J
Chloromethane	~	~	~	0.0037 U	0.0062 U	0.0042 U	0.0038 U	0.0058 U	0.0092 U	0.0043 U	0.0046 U	0.0053 U	0.0039 U	0.0045 U	0.0041 U	0.0042 U	0.0042 U
Cis-1,2-Dichloroethene	0.25	0.25	100	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Cis-1,3-Dichloropropene	~	~	~	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.00067 U	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
Cymene	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Dibromochloromethane	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Dibromomethane	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Dichlorodifluoromethane	~	~	~	0.0093 UJ	0.015 UJ	0.01 UJ	0.0094 UJ	0.014 UJ	0.023 UJ	0.011 UJ	0.012 U	0.013 UJ	0.0097 UJ	0.011 U	0.01 UJ	0.01 UJ	0.01 U
Diethyl Ether (Ethyl Ether)	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Ethylbenzene	1	1	41	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Hexachlorobutadiene	~	~	~	0.0037 U	0.0062 U	0.0042 U	0.0038 U	0.0058 U	0.0092 U	0.0043 U	0.0046 U	0.0053 U	0.0039 U	0.0045 U	0.0041 U	0.0042 U	0.0042 U
Isopropylbenzene (Cumene)	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
M,P-Xylene	~	~	~	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Methyl Ethyl Ketone (2-Butanone)	0.12	0.12	100	0.0093 UJ	0.015 UJ	0.01 UJ	0.0094 UJ	0.014 UJ	0.023 UJ	0.011 UJ	0.012 UJ	0.013 UJ	0.0097 UJ	0.011 UJ	0.01 UJ	0.01 UJ	0.01 UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	~	~	~	0.0093 UJ	0.015 UJ	0.01 UJ	0.0094 UJ	0.014 UJ	0.023 UJ	0.011 UJ	0.012 U	0.013 UJ	0.0097 UJ	0.011 U	0.01 UJ	0.01 UJ	0.01 UJ
Methylene Chloride	0.05	0.05	100	0.0047 U	0.0077 U	0.0052 U	0.0047 U	0.0073 U	0.011 U	0.0053 U	0.0058 U	0.0067 U	0.0048 U	0.0057 U	0.0051 U	0.0053 U	0.0053 U
Naphthalene	12	12	100	0.0037 U	0.0062 U	0.012	0.0038 U	0.0058 U	0.0092 U	0.0043 U	0.0046 U	0.0053 U	0.0039 U	0.0045 U	0.0041 U	0.0042 U	0.0042 U
n-Butylbenzene	12	12	100	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
n-Propylbenzene	3.9	3.9	100	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
o-Xylene (1,2-Dimethylbenzene)	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Sec-Butylbenzene	11	11	100	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Styrene	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
T-Butylbenzene	5.9	5.9	100	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Tert-Butyl Methyl Ether	0.93	0.93	100	0.0019 U	0.0031 U	0.0021 U	0.0019 U	0.0029 U	0.0046 U	0.0021 U	0.0023 U	0.0027 U	0.0019 U	0.0023 U	0.002 U	0.0021 U	0.0021 U
Tetrachloroethene (PCE)	1.3	1.3	19	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.0004 J	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
Toluene	0.7	0.7	100	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Total 1,2-Dichloroethene (Cis and Trans)	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Total Xylenes	0.26	1.6	100	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Total, 1,3-Dichloropropene (Cis And Trans)	~	~	~	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.00067 U	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
Trans-1,2-Dichloroethene	0.19	0.19	100	0.0014 U	0.0023 U	0.0016 U	0.0014 U	0.0022 U	0.0034 U	0.0016 U	0.0017 U	0.002 U	0.0014 U	0.0017 U	0.0015 U	0.0016 U	0.0016 U
Trans-1,3-Dichloropropene	~	~	~	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Trans-1,4-Dichloro-2-Butene	~	~	~	0.0047 U	0.0077 U	0.0052 U	0.0047 U	0.0073 U	0.011 U	0.0053 U	0.0058 U	0.0067 U	0.0048 U	0.0057 U	0.0051 U	0.0053 U	0.0053 U
Trichloroethene (TCE)	0.47	0.47	21	0.00047 U	0.00077 U	0.00052 U	0.00047 U	0.00073 U	0.0011 U	0.00053 U	0.00058 U	0.0011	0.00048 U	0.00057 U	0.00051 U	0.00053 U	0.00053 U
Trichlorofluoromethane	~	~	~	0.0037 U	0.0062 U	0.0042 U	0.0038 U	0.0058 U	0.0092 U	0.0043 U	0.0046 U	0.0053 U	0.0039 U	0.0045 U	0.0041 U	0.0042 U	0.0042 U
Vinyl Acetate	~	~	~	0.0093 U	0.015 U	0.01 U	0.0094 U	0.014 U	0.023 U	0.011 U	0.012 U	0.013 U	0.0097 U	0.011 U	0.01 U	0.01 U	0.01 U
Vinyl Chloride	0.02	0.02	0.9	0.00093 U	0.0015 U	0.001 U	0.00094 U	0.0014 U	0.0023 U	0.0011 U	0.0012 U	0.0013 U	0.00097 U	0.0011 U	0.001 U	0.001 U	0.001 U
Total BTEX	~	~	~	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total VOCs	~	~	~	0.011	ND	0.012	ND	ND	ND	ND	ND	0.0015	ND	0.00022	ND	ND	0.00034

Notes provided on Page 7.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Protection of Groundwater SCOs are underlined.
Concentrations aboveRestricted Use Restricted-Residential SCOs are shaded.

Table 1A
Remedial Action Work Plan
Soil Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location Sample ID Laboratory ID Sample Date Sample Depth (feet bgs)	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	LSB-3 006_LSB3_20-22 L2120301-06 4/21/2021 20-22		LSB-4 003_LSB4_0-2 L2120301-03 4/21/2021 0-2		LSB-4 004_LSB4_8-10 L2120301-04 4/21/2021 8-10		LSB-4 008_LSB4_20-22 L2120301-08 4/21/2021 20-22		LSB-5 001_LSB5_0-2 L2120301-01 4/21/2021 0-2		LSB-5 017_DUP01_042121 L2120301-17 4/21/2021 0-2		LSB-5 002_LSB5_13-15 L2120301-02 4/21/2021 13-15		LSB-5 022_LSB5_42-44 L2121015-02 4/23/2021 42-44		LSB-6 011_LSB6_0-2 L2120301-11 4/21/2021 0-2		LSB-6 012_LSB6_13-15 L2120301-12 4/21/2021 13-15		LSB-6 021_LSB6_42-44 L2121015-01 4/23/2021 42-44		LSB-7 013_LSB7_0-2 L2120301-13 4/21/2021 0-2		LSB-7 014_LSB7_8-10 L2120301-14 4/21/2021 8-10		LSB-7 027_LSB7_42-44 L2121234-03 4/26/2021 42-44	
Semivolatile Organic Compounds (mg/kg)																															
1,2,4,5-Tetrachlorobenzene	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
1,2,4-Trichlorobenzene	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
1,2-Dichlorobenzene	1.1	1.1	100	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
1,3-Dichlorobenzene	2.4	2.4	49	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
1,4-Dichlorobenzene	1.8	1.8	13	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
1,4-Dioxane (P-Dioxane)	0.1	0.1	13	0.026	U	0.035	U	0.032	U	0.026	U	*0.14*	U	*0.14*	U	0.032	U	0.029	U	*0.14*	U	0.032	U	0.028	U	0.027	U	0.031	U	0.028	U
2,4,5-Trichlorophenol	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	UJ	0.92	U	0.21	U	0.19	UJ	0.18	U	0.21	U	0.19	U
2,4,6-Trichlorophenol	~	~	~	0.11	U	0.14	U	0.13	U	0.1	U	0.54	U	0.57	U	0.13	U	0.12	UJ	0.55	U	0.13	U	0.11	UJ	0.11	U	0.12	U	0.11	U
2,4-Dichlorophenol	~	~	~	0.16	U	0.21	U	0.19	U	0.15	U	0.81	U	0.85	U	0.19	U	0.17	U	0.83	U	0.19	U	0.17	U	0.16	U	0.19	U	0.17	U
2,4-Dimethylphenol	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
2,4-Dinitrophenol	~	~	~	0.85	UJ	1.1	UJ	1	UJ	0.82	UJ	4.3	UJ	4.5	UJ	1	UJ	0.92	UJ	4.4	UJ	1	UJ	0.9	UJ	0.88	UJ	0.99	UJ	0.89	UJ
2,4-Dinitrotoluene	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
2,6-Dinitrotoluene	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	UJ	0.92	U	0.21	U	0.19	UJ	0.18	U	0.21	U	0.19	UJ
2-Chloronaphthalene	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
2-Chlorophenol	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
2-Methylnaphthalene	~	~	~	0.21	U	0.45		0.25	U	0.2	U	0.59	J	0.42	J	0.26	U	0.23	U	0.15	J	0.26	U	0.22	U	0.22	U	0.25	U	0.22	U
2-Methylphenol (o-Cresol)	0.33	0.33	100	0.18	U	0.23	U	0.21	U	0.17	U	*0.9*	U	*0.94*	U	0.21	U	0.19	U	*0.92*	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
2-Nitroaniline	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	UJ	0.21	U	0.19	UJ	0.92	UJ	0.21	U	0.19	UJ	0.18	U	0.21	U	0.19	UJ
2-Nitrophenol	~	~	~	0.38	UJ	0.51	UJ	0.45	UJ	0.37	UJ	2	UJ	2	UJ	0.46	UJ	0.41	U	2	UJ	0.46	UJ	0.4	U	0.39	UJ	0.45	UJ	0.4	UJ
3 & 4 Methylphenol (m&p Cresol)	0.33	0.33	100	0.25	U	*0.34*	U	0.3	U	0.24	U	*1.3*	U	*1.4*	U	0.31	U	0.28	U	*1.3*	U	0.31	U	0.27	U	0.26	U	0.3	U	0.27	U
3,3'-Dichlorobenzidine	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	UJ	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
3-Nitroaniline	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
4,6-Dinitro-2-Methylphenol	~	~	~	0.46	UJ	0.61	UJ	0.55	UJ	0.44	UJ	2.3	UJ	2.4	U	0.56	UJ	0.5	U	2.4	UJ	0.56	UJ	0.48	U	0.47	UJ	0.54	UJ	0.48	UJ
4-Bromophenyl Phenyl Ether	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
4-Chloro-3-Methylphenol	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
4-Chloroaniline	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
4-Chlorophenyl Phenyl Ether	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
4-Nitroaniline	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
4-Nitrophenol	~	~	~	0.25	U	0.33	U	0.29	U	0.24	U	1.3	U	1.3	UJ	0.3	U	0.27	UJ	1.3	UJ	0.3	U	0.26	UJ	0.26	U	0.29	U	0.26	U
Acenaphthene	20	98	100	0.14	U	1.1		0.17	U	0.14	U	0.72	U	0.76	U	0.17	U	0.15	U	0.54	J	0.17	U	0.15	U	0.15	U	0.16	U	0.15	U
Acenaphthylene	100	107	100	0.14	U	0.25		0.17	U	0.14	U	0.72	U	0.76	U	0.17	U	0.15	U	0.32	J	0.17	U	0.15	U	0.15	U	0.16	U	0.15	U
Acetophenone	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Anthracene	100	1,000	100	0.11	U	1.9		0.13	U	0.1	U	0.54	U	0.57	U	0.13	U	0.12	U	1.5		0.13	U	0.11	U	0.11	U	0.12	U	0.11	U
Benzo(a)anthracene	1	1	1	0.036	J	**4.5**		0.13	U	0.1	U	0.96		**1.1**		0.13	U	0.12	U	**4.6**		0.13	U	0.11	U	0.12		0.12	U	0.11	U
Benzo(a)pyrene	1	22	1	0.14	U	**3.6**		0.17	U	0.14	U	0.96		**1.1**		0.17	U	0.15	U	**4.4**		0.17	U	0.15	U	0.091	J	0.16	U	0.15	U
Benzo(b)fluoranthene	1	1.7	1	0.037	J	**5.2**		0.13	U	0.1	U	**1.4**		**1.6**		0.13	U	0.12	U	**6**		0.13	U	0.11	U	0.15		0.12	U	0.11	U
Benzo(g,h,i)Perylene	100	1,000	100	0.14	U	2		0.17	U	0.14	U	0.67	J	0.82		0.17	U	0.15	U	3		0.17	U	0.15	U	0.058	J	0.16	U	0.15	U
Benzo(k)fluoranthene	0.8	1.7	3.9	0.11	U	**1.4**		0.13	U	0.1	U	0.43	J	0.48	J	0.13	U	0.12	U	**2.1**		0.13	U	0.11	U	0.041	J	0.12	U	0.11	U
Benzoic Acid	~	~	~	0.57	UJ	0.76	UJ	0.68	UJ	0.55	UJ	2.9	UJ	3.1	U	0.69	UJ	0.62	U	3	UJ	0.7	UJ	0.6	U	0.59	UJ	0.67	UJ	0.6	UJ
Benzyl Alcohol	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	UJ	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Benzyl Butyl Phthalate	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	UJ
Biphenyl (Diphenyl)	~	~	~	0.4	U	0.1	J	0.48	U	0.39	U	2.1	U	2.2	U	0.49	U	0.44	U	2.1	U	0.49	U	0.42	U	0.42	U	0.47	U	0.42	U
Bis(2-chloroethoxy) methane	~	~	~	0.19	U	0.25	U	0.23	U	0.18	U	0.98	U	1	U	0.23	U	0.21	U	1	U	0.23	U	0.2	U	0.2	U	0.22	U	0.2	U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	~	~	~	0.16	U	0.21	U	0.19	U	0.15	U	0.81	U	0.85	U	0.19	U	0.17	U	0.83	U	0.19	U	0.17	U	0.16	U	0.19	U	0.17	U
Bis(2-chloroisopropyl) ether	~	~	~	0.21	U	0.28	U	0.25	U	0.2	U	1.1	U	1.1	UJ	0.26	U	0.23	U	1.1	UJ	0.26	U	0.22	U	0.22	U	0.25	U	0.22	U
Bis(2-ethylhexyl) phthalate	~	~	~	0.18	U	0.095	J	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Carbazole	~	~	~	0.18	U	1		0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.71	J	0.21	U	0.19	U	0.02	J	0.21	U	0.19	U
Chrysene	1	1	3.9	0.03	J	**4.1**		0.13	U	0.1	U	**1.1**		**1.1**		0.13	U	0.12	U	**5.4**		0.13	U	0.11	U	0.14		0.12	U	0.11	U
Dibenz(a,h)anthracene	0.33	1,000	0.33	0.11	U	**0.5**		0.13	U	0.1	U	0.15	J	0.17	J	0.13	U	0.12	U	**0.6**		0.13	U	0.11	U	0.11	U	0.12	U	0.11	U
Dibenzofuran	7	210	59	0.18	U	0.6		0.21	U	0.17	U	0.17	J	0.12	J	0.21	U	0.19	U	0.22	J	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Dibutyl phthalate	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Diethyl phthalate	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Dimethyl phthalate	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Dioctyl phthalate	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Fluoranthene	100	1,000	100	0.06	J	8.2		0.13	U	0.1	U	1.8		2		0.13	U	0.12	U	10		0.13	U	0.11	U	0.26		0.12	U	0.11	U
Fluorene	30	386	100	0.18	U	0.91		0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.5	J	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Hexachlorobenzene	0.33	3.2	1.2	0.11	U	0.14	U	0.13	U	0.1	U	*0.54*	U	*0.57*	U	0.13	U	0.12	U	*0.55*	U	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U
Hexachlorobutadiene	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	U	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Hexachlorocyclopentadiene	~	~	~	0.5	UJ	0.67	UJ	0.6	UJ	0.49	UJ	2.6	UJ	2.7	U	0.61	UJ	0.55	U	2.6	UJ	0.61	UJ	0.53	U	0.52	UJ	0.59	UJ	0.53	U
Hexachloroethane	~	~	~	0.14	U	0.19	U	0.17	U	0.14	U	0.72	U	0.76	U	0.17	U	0.15	U	0.74	U	0.17	U	0.15	U	0.15	U	0.16	U	0.15	U
Indeno(1,2,3-cd)pyrene	0.5	8.2	0.5	0.14	U	**2.2**		0.17	U	0.14	U	**0.7**	J	**0.82**		0.17	U	0.15	U	**3**		0.17	U	0.15	U	0.061	J	0.16	U	0.15	U
Isophorone	~	~	~	0.16	U	0.21	U	0.19	U	0.15	U	0.81	U	0.85	U	0.19	U	0.17	U	0.83	U	0.19	U	0.17	U	0.16	U	0.19	U	0.17	U
Naphthalene	12	12	100	0.18	U	0.67		0.04	J	0.17	U	0.45	J	0.34	J	0.21	U	0.19	U	0.14	J	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Nitrobenzene	~	~	~	0.16	U	0.21	U	0.19	U	0.15	U	0.81	U	0.85	UJ	0.19	U	0.17	U	0.83	U	0.19	U	0.17	U	0.16	U	0.19	U	0.17	U
n-Nitrosodi-N-Propylamine	~	~	~	0.18	U	0.23	U	0.21	U	0.17	U	0.9	U	0.94	UJ	0.21	U	0.19	U	0.92	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
n-Nitrosodiphenylamine	~	~	~	0.14	U	0.19	U	0.17	U	0.14	U	0.72	U	0.76	U	0.17	U	0.15	U	0.74	U	0.17	U	0.15	U	0.15	U	0.16	U	0.15	U
Pentachlorophenol	0.8	0.8	6.7	0.14	U	0.19	U	0.17	U	0.14	U	0.72	U	0.76	U	0.17	U	0.15	U	0.74	U	0.17	U	0.15	U	0.15	U	0.16	U	0.15	U
Phenanthrene	100	1,000	100	0.042	J	8.4		0.13	U	0.1	U	0.59		0.52	J	0.13	U	0.12	U	6.6		0.13	U	0.11	U	0.17		0.12	U	0.11	U
Phenol	0.33	0.33	100	0.18	U	0.23	U	0.21	U	0.17	U	*0.9*	U	*0.94*	U	0.21	U	0.19	U	*0.92*	U	0.21	U	0.19	U	0.18	U	0.21	U	0.19	U
Pyrene	100	1,000	100	0.055	J	6.9		0.13	U	0.1	U	1.6		1.7		0.13	U	0.12	U	9.3		0.13	U	0.11	U	0.24		0.12	U	0.11	U

Notes provided on Page 7.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Protection of Groundwater SCOs are underlined.
Concentrations aboveRestricted Use Restricted-Residential SCOs are shaded.

Table 1A
Remedial Action Work Plan
Soil Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	LSB-3	LSB-4	LSB-4	LSB-4	LSB-5	LSB-5	LSB-5	LSB-5	LSB-6	LSB-6	LSB-6	LSB-7	LSB-7	LSB-7
Sample ID				006_LSB3_20-22	003_LSB4_0-2	004_LSB4_8-10	008_LSB4_20-22	001_LSB5_0-2	017_DUP01_042121	002_LSB5_13-15	022_LSB5_42-44	011_LSB6_0-2	012_LSB6_13-15	021_LSB6_42-44	013_LSB7_0-2	014_LSB7_8-10	027_LSB7_42-44
Laboratory ID				L2120301-06	L2120301-03	L2120301-04	L2120301-08	L2120301-01	L2120301-17	L2120301-02	L2121015-02	L2120301-11	L2120301-12	L2121015-01	L2120301-13	L2120301-14	L2121234-03
Sample Date				4/21/2021	4/21/2021	4/21/2021	4/21/2021	4/21/2021	4/21/2021	4/21/2021	4/23/2021	4/21/2021	4/21/2021	4/23/2021	4/21/2021	4/21/2021	4/26/2021
Sample Depth (feet bgs)				20-22	0-2	8-10	20-22	0-2	0-2	13-15	42-44	0-2	13-15	42-44	0-2	8-10	42-44
Pesticides (mg/kg)																	
4,4'-DDD	0.0033	14	13	0.00165 U	0.00219 U	0.002 U	0.00159 U	*0.00861* U	*0.0174* U	0.00199 U	0.0018 U	0.00174 U	0.00195 U	0.0018 U	0.00171 U	0.00198 U	0.00176 U
4,4'-DDE	0.0033	17	8.9	0.00165 U	0.00219 U	0.002 U	0.00159 U	*0.00861* U	*0.0174* U	0.00199 U	0.0018 U	0.00174 U	0.00195 U	0.0018 U	0.00171 U	0.00198 U	0.00176 U
4,4'-DDT	0.0033	136	7.9	0.00309 U	**0.00636**	*0.00374* U	0.00298 U	*0.0161* U	*0.0327* U	*0.00374* U	*0.00337* U	0.00327 U	*0.00366* U	*0.00338* U	0.0032 U	*0.00372* U	0.00329 U
Aldrin	0.005	0.19	0.097	0.00165 U	0.00219 U	0.002 U	0.00159 U	*0.00861* U	*0.0174* U	0.00199 U	0.0018 U	0.00174 U	0.00195 U	0.0018 U	0.00171 U	0.00198 U	0.00176 U
Alpha BHC (Alpha Hexachlorocyclohexane)	0.02	0.02	0.48	0.000687 U	0.000914 U	0.000832 U	0.000662 U	0.00359 U	0.00727 U	0.00083 U	0.000749 U	0.000726 U	0.000813 U	0.00075 U	0.000711 U	0.000826 U	0.000732 U
Alpha Chlordane	0.094	2.9	4.2	0.00206 U	0.00274 U	0.0025 U	0.00199 U	0.0108 U	0.0218 U	0.00249 U	0.00225 U	0.00218 U	0.00244 U	0.00225 U	0.00213 U	0.00248 U	0.0022 U
Alpha Endosulfan	2.4	102	24	0.00165 U	0.00219 U	0.002 U	0.00159 U	0.00861 U	0.0174 U	0.00199 U	0.0018 U	0.00174 U	0.00195 U	0.0018 U	0.00171 U	0.00198 U	0.00176 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.09	0.36	0.00165 U	0.00219 U	0.002 U	0.00159 U	0.00861 U	0.0174 U	0.00199 U	0.0018 U	0.00174 U	0.00195 U	0.0018 U	0.00171 U	0.00198 U	0.00176 U
Beta Endosulfan	2.4	102	24	0.00165 U	0.00219 U	0.002 U	0.00159 U	0.00861 U	0.0174 U	0.00199 U	0.0018 U	0.00174 U	0.00195 U	0.0018 U	0.00171 U	0.00198 U	0.00176 U
Chlordane (alpha and gamma)	~	~	~	0.0137 U	0.0183 U	0.0166 U	0.0132 U	0.0717 U	0.145 U	0.0166 U	0.015 U	0.0145 U	0.0163 U	0.015 U	0.0142 U	0.0165 U	0.0146 U
Delta Bhc (Delta Hexachlorocyclohexane)	0.04	0.25	100	0.00165 U	0.00219 U	0.002 U	0.00159 U	0.00861 U	0.0174 U	0.00199 U	0.0018 U	0.00174 U	0.00195 U	0.0018 U	0.00171 U	0.00198 U	0.00176 U
Dieldrin	0.005	0.1	0.2	0.00103 U	0.00137 U	0.00125 U	0.000994 U	*0.00538* U	*0.0109* U	0.00124 U	0.00112 U	0.00109 U	0.00122 U	0.00112 U	0.00107 U	0.00124 U	0.0011 U
Endosulfan Sulfate	2.4	1,000	24	0.000687 U	0.000914 U	0.000832 U	0.000662 U	0.00359 U	0.00727 U	0.00083 U	0.000749 U	0.000726 U	0.000813 U	0.00075 U	0.000711 U	0.000826 U	0.000732 U
Endrin	0.014	0.06	11	0.000687 U	0.000914 U	0.000832 U	0.000662 U	0.00359 U	0.00727 U	0.00083 U	0.000749 U	0.000726 U	0.000813 U	0.00075 U	0.000711 U	0.000826 U	0.000732 U
Endrin Aldehyde	~	~	~	0.00206 U	0.00274 U	0.0025 U	0.00199 U	0.0108 U	0.0218 U	0.00249 U	0.00225 U	0.00218 U	0.00244 U	0.00225 U	0.00213 U	0.00248 U	0.0022 U
Endrin Ketone	~	~	~	0.00165 U	0.00219 U	0.002 U	0.00159 U	0.00861 U	0.0174 U	0.00199 U	0.0018 U	0.00174 U	0.00195 U	0.0018 U	0.00171 U	0.00198 U	0.00176 U
Gamma Bhc (Lindane)	0.1	0.1	1.3	0.000687 U	0.000914 U	0.000832 U	0.000662 U	0.00359 U	0.00727 U	0.00083 U	0.000749 U	0.000726 U	0.000813 U	0.00075 U	0.000711 U	0.000826 U	0.000732 U
Gamma Chlordane	~	~	~	0.00206 U	0.00274 U	0.0025 U	0.00199 U	0.0108 U	0.0218 U	0.00249 U	0.00225 U	0.00218 U	0.00244 U	0.00225 U	0.00213 U	0.00248 U	0.0022 U
Heptachlor	0.042	0.38	2.1	0.000824 U	0.0011 U	0.000998 U	0.000795 U	0.0043 U	0.00873 U	0.000996 U	0.000899 U	0.000871 U	0.000976 U	0.0009 U	0.000853 U	0.000992 U	0.000878 U
Heptachlor Epoxide	~	~	~	0.00309 U	0.00411 U	0.00374 U	0.00298 U	0.0161 U	0.0327 U	0.00374 U	0.00337 U	0.00327 U	0.00366 U	0.00338 U	0.0032 U	0.00372 U	0.00329 U
Methoxychlor	~	~	~	0.00309 U	0.00411 U	0.00374 U	0.00298 U	0.0161 U	0.0327 U	0.00374 U	0.00337 U	0.00327 U	0.00366 U	0.00338 U	0.0032 U	0.00372 U	0.00329 U
Toxaphene	~	~	~	0.0309 UJ	0.0411 UJ	0.0374 UJ	0.0298 UJ	0.161 UJ	0.327 UJ	0.0374 UJ	0.0337 U	0.0327 UJ	0.0366 UJ	0.0338 U	0.032 UJ	0.0372 UJ	0.0329 UJ
Herbicides (mg/kg)																	
2,4,5-T (Trichlorophenoxyacetic Acid)	~	~	~	0.172 U	0.23 U	0.21 U	0.17 U	0.358 U	0.189 U	0.211 U	0.188 U	0.182 U	0.211 U	0.188 U	0.185 U	0.207 U	0.186 U
2,4-D (Dichlorophenoxyacetic Acid)	~	~	~	0.172 U	0.23 U	0.21 U	0.17 U	0.358 U	0.189 U	0.211 U	0.188 U	0.182 U	0.211 U	0.188 U	0.185 U	0.207 U	0.186 U
Silvex (2,4,5-Tp)	3.8	3.8	100	0.172 U	0.23 U	0.21 U	0.17 U	0.358 U	0.189 U	0.211 U	0.188 U	0.182 U	0.211 U	0.188 U	0.185 U	0.207 U	0.186 U
Polychlorinated Biphenyls (mg/kg)																	
PCB-1016 (Aroclor 1016)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
PCB-1221 (Aroclor 1221)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
PCB-1232 (Aroclor 1232)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
PCB-1242 (Aroclor 1242)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
PCB-1248 (Aroclor 1248)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
PCB-1254 (Aroclor 1254)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
PCB-1260 (Aroclor 1260)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
PCB-1262 (Aroclor 1262)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
PCB-1268 (Aroclor 1268)	~	~	~	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
Total PCBs	0.1	3.2	1	0.0344 U	0.0463 U	0.0407 U	0.0338 U	0.0349 U	0.0384 U	0.0415 U	0.038 U	0.0366 U	0.0409 U	0.0358 U	0.0359 U	0.0412 U	0.0353 U
Inorganics (mg/kg)																	
Aluminum	~	~	~	4,190	10,300	7,490	3,170	2,520	3,320	6,660	2,010	4,650	7,320	1,610	6,860	7,820	1,940
Antimony	~	~	~	4.15 U	5.37 U	4.98 U	4.02 U	4.25 U	4.56 U	5.02 U	4.47 U	0.444 J	4.9 U	4.37 U	4.4 U	4.98 U	4.42 U
Arsenic	13	16	16	1.21	3.05	0.996 U	0.57 J	4.92 J	10.9 J	1 U	0.733 J	7.38	0.98 U	0.454 J	2.33	0.997 U	1.01
Barium	350	820	400	37.4	224	61.5	23.8	89.5 J	107	48.9	14.3	150	56.7	13.1	77.7	49.1	15.6
Beryllium	7.2	47	72	0.191 J	0.408 J	0.388 J	0.161 J	0.17 J	0.228 J	0.331 J	0.447 U	0.214 J	0.412 J	0.437 U	0.343 J	0.399 J	0.088 J
Cadmium	2.5	7.5	4.3	0.299 J	0.623 J	0.518 J	0.249 J	0.348 J	0.484 J	0.431 J	0.188 J	0.53 J	0.5 J	0.14 J	0.554 J	0.518 J	0.132 J
Calcium	~	~	~	10,100	59,500	1,440	2,680	33,900	44,500	1,580	5,000	20,900	1,710	3,820	16,500	1,920	3,360 J
Chromium, Hexavalent	1	19	110	0.851 U	*1.13* U	*1.03* U	0.832 U	0.873 U	0.923 U	*1.03* U	0.924 U	0.889 U	*1.03* U	0.228 J	0.9 U	*1.01* U	0.903 U
Chromium, Total	~	~	~	19.1	20.1	22.2	9.21	6.8	7.98	17.1	5.05	10.5	20.2	4.78	17.5	21.4	6.04
Chromium, Trivalent	30	~	180	19	20	22	9.2	6.8	8	17	5	10	20	4.6 J	18	21	6
Cobalt	~	~	~	5.89	6.6	9	5.7	2.98	3.84	7.99	2.67	4.02	8.82	1.88	6.72	8.39	2.78
Copper	50	1720	270	16.1	21.7	17.2	11.6	38.8 J	31.2	14.3	5.22	19	17.7	4.97	21.5	17.2	7.88
Cyanide	27	40	27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	~	~	~	9,730	14,100	17,600	7,510	7,300	8,820	15,600	6,720	8,690	17,100	4,680	14,300	17,500	5,690
Lead	63	450	400	6.81	**235**	11.1	5.72	**97.1**	**124**	5 J	2.82 J	**122**	6.58	2.28 J	**124**	6.5	2.75 J
Magnesium	~	~	~	6,250	5,000	3,000	4,960	14,200	21,400	2,940	2,250	4,260	3,640	1,820	3,030	3,010	2,480 J
Manganese	1,600	2,000	2,000	197	285	377	166	87.6 J	136	323	155	123	370	132	262	345	141 J
Mercury	0.18	0.73	0.81	0.067 U	**1.4**	**0.331**	0.066 U	0.161 J	**0.243**	0.081 U	0.075 U	**0.2**	0.082 U	0.074 U	**0.214**	0.079 U	0.077 U
Nickel	30	130	310	**38.8**	15.7	16.6	**38.5**	7.64	10.6	14.8	6.11	8.92	22.4	6.33	12.5	16.9	15.6 J
Potassium	~	~	~	1,120	1,700	2,210	885	324	456	1,590	290	688	1,820	278	1,220	1,480	367
Selenium	3.9	4	180	1.66 U	2.15 U	1.99 U	1.61 U	1.7 U	1.82 U	2.01 U	1.79 U	0.282 J	1.96 U	1.75 U	1.76 U	1.99 U	1.77 U
Silver	2	8.3	180	0.83 U	1.07 U	0.996 U	0.803 U	0.85 U	0.912 U	1 U	0.894 U	0.855 U	0.98 U	0.874 U	0.88 U	0.997 U	0.884 U
Sodium	~	~	~	252	183 J	53.5 J	187	169 J	198	69.5 J	179 U	388	93.4 J	175 U	131 J	217	84.6 J
Thallium	~	~	~	1.66 U	2.15 U	1.99 U	1.61 U	1.7 U	1.82 U	2.01 U	1.79 U	1.71 U	1.96 U	1.75 U	1.76 U	1.99 U	1.77 U
Vanadium	~	~	~	20.7	31.9	29.6	13.3	19.8	26.1	24.9	8.8	22.7	27.6	6.06	25.3	28.8	8.91
Zinc	109	2,480	10,000	27.1	**204**	46.2	23.9	76.1 J	96.2	36.8	13.4	**185**	48.2	10.3	82	45.2	26.1
General Chemistry (%)																	
Total Solids	~	~	~	94	70.8	77.8	96.2	91.6	86.7	77.5	86.6	90	77.3	87.9	88.9	79.1	88.6

Notes provided on Page 7.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Protection of Groundwater SCOs are underlined.
Concentrations aboveRestricted Use Restricted-Residential SCOs are shaded.

Table 1A
Remedial Action Work Plan
Soil Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Notes:

1. Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use, Protection of Groundwater and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).

2. Criterion comparisons for 3- & 4-methylphenol (m&p cresol) are provided for reference. Promulgated SCOs are for 3-methylphenol (m-cresol) and 4-methylphenol (p-cresol).

3. Detected analytical results above Unrestricted Use SCOs are bolded.
4. Detected analytical results above Protection of Groundwater SCOs are underlined.
5. Detected analytical results above Restricted Use Restricted-Residential SCOs are shaded.
6. Analytical results with reporting limits (RL) above the lowest applicable criteria are italicized.
7. Sample DUP01_053015 is a duplicate sample of EB07_10-12; sample 026_DUP2 is a duplicate sample of 025_LSB2_42-44; and sample 017_DUP01_042121 is a duplicate sample of 001_LSB5_0-2.
7. ~ = Regulatory limit for this analyte does not exist
8. bgs = below grade surface
9. mg/kg = milligrams per kilogram
10. % = percent
11. NA = Not analyzed
12. ND = Not detected

Qualifiers:
J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
U = The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Notes provided on Page 7.
Concentrations above Unrestricted Use SCOs are bolded.
Concentrations above Protection of Groundwater SCOs are underlined.
Concentrations aboveRestricted Use Restricted-Residential SCOs are shaded.

Table 1B
Remedial Action Work Plan
Soil Sample Analytical Results - Emerging Contaminants

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location Sample ID Laboratory ID Sample Date Sample Depth (feet bgs)	NYSDEC Part 375 Unrestricted Use Guidance Values	NYSDEC Part 375 Protection of Groundwater Guidance Values	NYSDEC Part 375 Restricted Use Restricted-Residential Guidance Values	LSB-1 015_LSB1_0-2 L2120301-15 4/21/2021 0-2	LSB-1 016_LSB1_8-10 L2120301-16 4/21/2021 8-10	LSB-1 023_LSB1_40-42 L2121015-03 4/23/2021 40-42	LSB-2 009_LSB2_0-2 L2120301-09 4/21/2021 0-2	LSB-2 010_LSB2_8-10 L2120301-10 4/21/2021 8-10	LSB-2 025_LSB2_42-44 L2121234-01 4/26/2021 42-44	LSB-2 026_DUP2 L2121234-02 4/26/2021 42-44	LSB-3 005_LSB3_0-2 L2120301-05 4/21/2021 0-2	LSB-3 007_LSB3_13-15 L2120301-07 4/21/2021 13-15	LSB-3 006_LSB3_20-22 L2120301-06 4/21/2021 20-22	LSB-4 003_LSB4_0-2 L2120301-03 4/21/2021 0-2	LSB-4 004_LSB4_8-10 L2120301-04 4/21/2021 8-10	LSB-4 008_LSB4_20-22 L2120301-08 4/21/2021 20-22
Per and Polyfluoroalkyl Substances (ppb)																
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 UJ	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Perfluorobutanesulfonic Acid (PFBS)	~	~	~	0.266 U	0.286 U	0.255 UJ	0.256 U	0.294 U	0.251 U	0.25 U	0.272 U	0.244 U	0.238 U	0.328 U	0.298 U	0.233 U
Perfluorobutanoic acid (PFBA)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Perfluorodecanesulfonic Acid (PFDS)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Perfluorodecanoic Acid (PFDA)	~	~	~	0.266 U	0.286 U	0.255 U	0.256 U	0.294 U	0.251 U	0.25 U	0.104 J	0.244 U	0.238 U	0.09 J	0.298 U	0.233 U
Perfluorododecanoic Acid (PFDoA)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Perfluoroheptanesulfonic Acid (PFHpS)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Perfluoroheptanoic acid (PFHpA)	~	~	~	0.266 U	0.286 U	0.255 U	0.256 U	0.294 U	0.251 U	0.25 U	0.272 UJ	0.244 U	0.238 U	0.328 U	0.298 U	0.233 U
Perfluorohexanesulfonic Acid (PFHxS)	~	~	~	0.266 U	0.286 U	0.255 U	0.256 U	0.294 U	0.251 U	0.25 U	0.272 U	0.244 U	0.238 U	0.328 U	0.298 U	0.233 U
Perfluorohexanoic Acid (PFHxA)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Perfluorononanoic Acid (PFNA)	~	~	~	0.266 U	0.286 U	0.255 U	0.256 U	0.294 U	0.251 U	0.25 U	0.097 J	0.244 U	0.238 U	0.328 U	0.298 U	0.233 U
Perfluorooctanesulfonamide (FOSA)	~	~	~	0.532 U	0.572 UJ	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Perfluorooctanesulfonic Acid (PFOS)	0.88	1	44	0.266 U	0.286 U	0.255 U	0.256 U	0.294 U	0.251 U	0.25 U	0.414 J	0.244 U	0.238 U	0.328 U	0.298 U	0.233 U
Perfluorooctanoic Acid (PFOA)	0.66	0.8	33	0.125 J	**<u>1.12</u>**	0.255 U	0.111 J	0.568	0.251 U	0.25 U	0.126 J	0.244 U	0.238 U	0.158 J	0.165 J	0.233 U
Perfluoropentanoic Acid (PFPeA)	~	~	~	0.532 U	0.572 U	0.509 UJ	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.069 J	0.596 U	0.466 U
Perfluorotetradecanoic Acid (PFTA)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Perfluorotridecanoic Acid (PFTrDA)	~	~	~	0.532 UJ	0.572 UJ	0.509 U	0.511 UJ	0.587 UJ	0.502 U	0.5 U	0.544 UJ	0.488 UJ	0.477 UJ	0.655 UJ	0.596 UJ	0.466 UJ
Perfluoroundecanoic Acid (PFUnA)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	~	~	~	0.532 U	0.572 U	0.509 U	0.511 U	0.587 U	0.502 U	0.5 U	0.544 U	0.488 U	0.477 U	0.655 U	0.596 U	0.466 U
Total PFOA and PFOS	~	~	~	0.266 U	0.286 U	0.255 U	0.256 U	0.568	0.251 U	0.25 U	0.272 U	0.244 U	0.238 U	0.328 U	0.298 U	0.233 U

Notes provided on Page 3.
Concentrations above Unrestricted Use Guidance Values are bolded.
Concentrations above Restricted Use Restricted-Residential Guidance Values are shaded.
Concentrations above PGW Guidance Values are underlined.

Table 1B
Remedial Action Work Plan
Soil Sample Analytical Results - Emerging Contaminants

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location Sample ID Laboratory ID Sample Date Sample Depth (feet bgs)	NYSDEC Part 375 Unrestricted Use Guidance Values	NYSDEC Part 375 Protection of Groundwater Guidance Values	NYSDEC Part 375 Restricted Use Restricted-Residential Guidance Values	LSB-5 001_LSB5_0-2 L2120301-01 4/21/2021 0-2		LSB-5 017_DUP01_042121 L2120301-17 4/21/2021 0-2		LSB-5 002_LSB5_13-15 L2120301-02 4/21/2021 13-15		LSB-5 022_LSB5_42-44 L2121015-02 4/23/2021 42-44		LSB-6 011_LSB6_0-2 L2120301-11 4/21/2021 0-2		LSB-6 012_LSB6_13-15 L2120301-12 4/21/2021 13-15		LSB-6 021_LSB6_42-44 L2121015-01 4/23/2021 42-44		LSB-7 013_LSB7_0-2 L2120301-13 4/21/2021 0-2		LSB-7 014_LSB7_8-10 L2120301-14 4/21/2021 8-10		LSB-7 027_LSB7_42-44 L2121234-03 4/26/2021 42-44	
Per and Polyfluoroalkyl Substances (ppb)																							
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	~	~	~	0.497	U	0.095	J	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluorobutanesulfonic Acid (PFBS)	~	~	~	0.249	U	0.266	U	0.317	U	0.256	UJ	0.265	U	0.312	U	0.263	U	0.254	U	0.297	U	0.264	U
Perfluorobutanoic acid (PFBA)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluorodecanesulfonic Acid (PFDS)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluorodecanoic Acid (PFDA)	~	~	~	0.249	U	0.266	U	0.317	U	0.256	U	0.265	U	0.312	U	0.263	UJ	0.254	U	0.297	U	0.264	U
Perfluorododecanoic Acid (PFDoA)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluoroheptanesulfonic Acid (PFHpS)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluoroheptanoic acid (PFHpA)	~	~	~	0.249	U	0.266	U	0.317	U	0.256	U	0.265	U	0.312	U	0.263	U	0.254	U	0.297	U	0.264	U
Perfluorohexanesulfonic Acid (PFHxS)	~	~	~	0.249	U	0.266	U	0.317	U	0.256	U	0.265	U	0.312	U	0.263	U	0.254	U	0.297	U	0.264	U
Perfluorohexanoic Acid (PFHxA)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluorononanoic Acid (PFNA)	~	~	~	0.249	U	0.266	U	0.317	U	0.256	U	0.265	U	0.312	U	0.263	UJ	0.254	U	0.297	U	0.264	U
Perfluorooctanesulfonamide (FOSA)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluorooctanesulfonic Acid (PFOS)	0.88	1	44	0.249	U	0.266	U	0.317	U	0.256	U	0.265	U	0.312	U	0.263	U	0.254	U	0.297	U	0.264	U
Perfluorooctanoic Acid (PFOA)	0.66	0.8	33	0.102	J	0.154	J	**0.75**		0.256	U	0.139	J	0.532	J	0.263	U	0.488		**0.907**		0.264	U
Perfluoropentanoic Acid (PFPeA)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	UJ	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluorotetradecanoic Acid (PFTA)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Perfluorotridecanoic Acid (PFTrDA)	~	~	~	0.497	UJ	0.532	UJ	0.634	UJ	0.512	U	0.53	UJ	0.625	UJ	0.525	U	0.508	UJ	0.595	UJ	0.529	U
Perfluoroundecanoic Acid (PFUnA)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	~	~	~	0.497	U	0.532	U	0.634	U	0.512	U	0.53	U	0.625	U	0.525	U	0.508	U	0.595	U	0.529	U
Total PFOA and PFOS	~	~	~	0.249	U	0.266	U	0.75		0.256	U	0.265	U	0.532		0.263	U	0.488		0.907		0.264	U

Notes provided on Page 3.
Concentrations above Unrestricted Use Guidance Values are bolded.
Concentrations above Restricted Use Restricted-Residential Guidance Values are shaded.
Concentrations above PGW Guidance Values are underlined.

Table 1B
Remedial Action Work Plan
Soil Sample Analytical Results - Emerging Contaminants

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Notes:

1. Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Part 375 Remedial Programs Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS) Unrestricted Use, Protection of Groundwater and Restricted Use Restricted-Residential Guidance Values (April 2023).
2. Detected analytical results above Unrestricted Use Guidance Values are bolded.
3. Detected analytical results above Protection of Groundwater Guidance Values are underlined.
4. Detected analytical results above Restricted Use Restricted-Residential Guidance Values are shaded.
5. Analytical results with reporting limits (RL) above the lowest applicable criteria are italicized.
6. Sample 026_DUP2 is a duplicate sample of 025_LSB2_42-44 and sample 017_DUP01_042121 is a duplicate sample of 001_LSB5_0-2.
7. ~ = Regulatory limit for this analyte does not exist
8. bgs = below grade surface
9. ppb = parts per billion

Qualifiers:

J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.

U = The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Notes provided on Page 3.
Concentrations above Unrestricted Use Guidance Values are bolded.
Concentrations above Restricted Use Restricted-Residential Guidance Values are shaded.
Concentrations above PGW Guidance Values are underlined.

Table 2A
Remedial Action Work Plan
Groundwater Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location	NYSDEC	LMW-1		LMW-2		LMW-3		LMW-4		LMW-4		LMW-5		MW11		MW11		MW-11	
Sample ID	SGVs	055_LMW-1		054_LMW-2		053_LMW-3		048_LMW-4		049_DUP-1		047_LMW-5		MW11_053015		GWDUP01_053015		056_MW11	
Laboratory ID		L2123074-03		L2123074-02		L2123074-01		L2122822-02		L2122822-03		L2122822-01		L1511932-07		L1511932-08		L2123074-04	
Sample Date		5/4/2021		5/4/2021		5/4/2021		5/3/2021		5/3/2021		5/3/2021		5/30/2015		5/30/2015		5/4/2021	
Volatile Organic Compounds (µg/L)																			
1,1,1,2-Tetrachloroethane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,1,1-Trichloroethane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,1,2,2-Tetrachloroethane	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-Trichloroethane	1	*1.5*	U	*1.5*	U	*1.5*	U	*1.5*	U	*1.5*	U	*1.5*	U	*1.5*	U	*1.5*	U	*1.5*	U
1,1-Dichloroethane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,1-Dichloroethene	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1-Dichloropropene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2,3-Trichlorobenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2,3-Trichloropropane	0.04	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U
1,2,4,5-Tetramethylbenzene	5	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,2,4-Trichlorobenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2,4-Trimethylbenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2-Dibromo-3-Chloropropane	0.04	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U
1,2-Dichlorobenzene	3	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,2-Dichloroethane	0.6	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-Dichloropropane	1	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
1,3,5-Trimethylbenzene (Mesitylene)	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,3-Dichlorobenzene	3	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,3-Dichloropropane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,4-Dichlorobenzene	3	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
1,4-Diethyl Benzene	~	2	U	2	U	2	U	2	U	2	U	2	U	2	UJ	2	UJ	2	U
1,4-Dioxane (P-Dioxane)	~	250	UJ	250	UJ	250	UJ	250	UJ	250	UJ	250	UJ	250	UJ	250	UJ	250	UJ
2,2-Dichloropropane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
2-Chlorotoluene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
2-Hexanone (MBK)	50	5	UJ	5	UJ	5	UJ	5	U	5	U	5	U	5	U	5	U	5	UJ
4-Chlorotoluene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
4-Ethyltoluene	~	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Acetone	50	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	U	5	U	5	UJ
Acrylonitrile	5	5	UJ	5	UJ	5	UJ	5	U	5	U	5	U	5	UJ	5	UJ	5	UJ
Benzene	1	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromobenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Bromochloromethane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Bromodichloromethane	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromoform	50	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Bromomethane	5	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ
Carbon Disulfide	60	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Carbon Tetrachloride	5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chlorobenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Chloroethane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Chloroform	7	**14**		**24**		**19**		**14**		**14**		**11**		**15**		**15**		**27**	
Chloromethane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	UJ	2.5	UJ	2.5	U
Cis-1,2-Dichloroethene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Cis-1,3-Dichloropropene	0.4	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U
Cymene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	UJ	2.5	UJ	2.5	U
Dibromochloromethane	50	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Dibromomethane	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dichlorodifluoromethane	5	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ
Diethyl Ether (Ethyl Ether)	~	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Ethylbenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Hexachlorobutadiene	0.5	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	U	*2.5*	UJ	*2.5*	UJ	*2.5*	U
Isopropylbenzene (Cumene)	5	2.5	U	2.5	U	2.5	U	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ	2.5	UJ	2.5	U
M,P-Xylene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Methyl Ethyl Ketone (2-Butanone)	50	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	U	5	U	5	UJ
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	~	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ
Methylene Chloride	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Naphthalene	10	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
n-Butylbenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	UJ	2.5	UJ	2.5	U
n-Propylbenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
o-Xylene (1,2-Dimethylbenzene)	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Sec-Butylbenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	UJ	2.5	UJ	2.5	U
Styrene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
T-Butylbenzene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	UJ	2.5	UJ	2.5	U
Tert-Butyl Methyl Ether	10	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Tetrachloroethene (PCE)	5	3.2		1.2		1.4		3.2		3.1		3.2		1.2		1.3		1.4	
Toluene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Total 1,2-Dichloroethene (Cis and Trans)	~	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Total Xylenes	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Total, 1,3-Dichloropropene (Cis And Trans)	0.4	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U
Trans-1,2-Dichloroethene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Trans-1,3-Dichloropropene	0.4	*0.5*	UJ	*0.5*	UJ	*0.5*	UJ	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	U	*0.5*	UJ
Trans-1,4-Dichloro-2-Butene	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Trichloroethene (TCE)	5	2.1		4.7		3.5		2.8		2.9		1.5		3.4		3.4		**5.8**	
Trichlorofluoromethane	5	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	UJ	2.5	UJ	2.5	U
Vinyl Acetate	~	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Vinyl Chloride	2	1	U	1	U	1	U	1	U	1	U	1	U	1	UJ	1	UJ	1	U
Total BTEX	~	ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total CVOCs	~	5.3		5.9		4.9		6		6		4.7		4.6		4.7		7.2	
Total VOCs	~	19.3		29.9		23.9		20		20		15.7		19.6		19.7		34.2	

Notes provided on Page 5.

Table 2A
Remedial Action Work Plan
Groundwater Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location	NYSDEC	LMW-1		LMW-2		LMW-3		LMW-4		LMW-4		LMW-5		MW11		MW11		MW-11	
Sample ID	SGVs	055_LMW-1		054_LMW-2		053_LMW-3		048_LMW-4		049_DUP-1		047_LMW-5		MW11_053015		GWDUP01_053015		056_MW11	
Laboratory ID		L2123074-03		L2123074-02		L2123074-01		L2122822-02		L2122822-03		L2122822-01		L1511932-07		L1511932-08		L2123074-04	
Sample Date		5/4/2021		5/4/2021		5/4/2021		5/3/2021		5/3/2021		5/3/2021		5/30/2015		5/30/2015		5/4/2021	
Semivolatile Organic Compounds (µg/L)																			
1,2,4,5-Tetrachlorobenzene	5	*10*	U	*10*	U	*10*	U	*10*	U	*10*	U	*10*	U	*10*	U	*10*	U	*10*	U
1,2,4-Trichlorobenzene	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
1,2-Dichlorobenzene	3	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,3-Dichlorobenzene	3	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
1,4-Dichlorobenzene	3	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
2,4,5-Trichlorophenol	~	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
2,4,6-Trichlorophenol	~	5	U	5	U	5	U	5	UJ	5	UJ	5	UJ	5	U	5	U	5	U
2,4-Dichlorophenol	1	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U
2,4-Dimethylphenol	1	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U
2,4-Dinitrophenol	1	*20*	UJ	*20*	UJ	*20*	UJ	*20*	UJ	*20*	UJ	*20*	UJ	*20*	U	*20*	U	*20*	UJ
2,4-Dinitrotoluene	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
2,6-Dinitrotoluene	5	5	UJ	4.5	J	5	UJ	5	UJ	5	UJ	5	UJ	5	U	5	U	5	UJ
2-Chloronaphthalene	10	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2-Chlorophenol	~	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
2-Methylnaphthalene	~	0.05	J	0.06	J	0.05	J	0.28		0.21		0.1	U	0.2	U	0.2	U	0.1	U
2-Methylphenol (o-Cresol)	~	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
2-Nitroaniline	5	5	U	5	U	5	U	5	UJ	5	UJ	5	UJ	5	U	5	U	5	U
2-Nitrophenol	~	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	U	10	U	10	UJ
3 & 4 Methylphenol (m&p Cresol)	~	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
3,3'-Dichlorobenzidine	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
3-Nitroaniline	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
4,6-Dinitro-2-Methylphenol	~	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	U	10	U	10	UJ
4-Bromophenyl Phenyl Ether	~	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
4-Chloro-3-Methylphenol	~	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
4-Chloroaniline	5	5	U	5	U	5	U	5	UJ	5	UJ	5	UJ	5	U	5	U	5	U
4-Chlorophenyl Phenyl Ether	~	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
4-Nitroaniline	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
4-Nitrophenol	~	10	U	10	U	10	U	10	UJ	10	UJ	10	UJ	10	U	10	U	10	U
Acenaphthene	20	0.1	U	0.04	J	0.07	J	0.38		0.3		0.1	U	0.2	U	0.2	U	0.1	U
Acenaphthylene	~	0.1	U	0.1	U	0.1	U	0.38		0.3		0.1	U	0.2	U	0.2	U	0.1	U
Acetophenone	~	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Anthracene	50	0.1	U	0.1	U	0.08	J	0.27		0.22		0.1	U	0.2	U	0.2	U	0.1	U
Benzo(a)anthracene	0.002	*0.1*	U	*0.1*	U	**0.22**		**0.07**	J	**0.07**	J	*0.1*	U	*0.2*	U	*0.2*	U	*0.1*	U
Benzo(a)pyrene	0	*0.1*	U	*0.1*	U	**0.22**		**0.02**	J	**0.02**	J	*0.1*	U	*0.2*	U	*0.2*	U	*0.1*	U
Benzo(b)fluoranthene	0.002	*0.1*	U	*0.1*	U	**0.27**		**0.02**	J	**0.03**	J	*0.1*	U	*0.2*	U	*0.2*	U	*0.1*	U
Benzo(g,h,i)Perylene	~	0.1	U	0.1	U	0.19		0.1	U	0.1	U	0.1	U	0.2	U	0.2	U	0.1	U
Benzo(k)fluoranthene	0.002	*0.1*	U	*0.1*	U	**0.11**		**0.01**	J	**0.02**	J	*0.1*	U	*0.2*	U	*0.2*	U	*0.1*	U
Benzoic Acid	~	50	UJ	9.8	J	50	UJ	50	UJ	50	UJ	50	UJ	50	U	50	U	50	UJ
Benzyl Alcohol	~	2	U	1.8	J	2	U	0.66	J	0.83	J	2	UJ	2	U	2	U	2	U
Benzyl Butyl Phthalate	50	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	U	5	U	5	UJ
Biphenyl (Diphenyl)	5	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Bis(2-chloroethoxy) methane	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Bis(2-chloroethyl) ether (2-chloroethyl ether)	1	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U
Bis(2-chloroisopropyl) ether	5	2	UJ	2	UJ	2	UJ	2	U	2	U	2	U	2	U	2	U	2	UJ
Bis(2-ethylhexyl) phthalate	5	3	U	**6.1**		1.7	J	3	U	3	U	3	U	3	U	3	U	3	U
Carbazole	~	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Chrysene	0.002	*0.1*	U	*0.1*	U	**0.24**		**0.08**	J	**0.08**	J	*0.1*	U	*0.2*	U	*0.2*	U	*0.1*	U
Dibenz(a,h)anthracene	~	0.1	U	0.1	U	0.03	J	0.1	U	0.1	U	0.1	U	0.2	U	0.2	U	0.1	U
Dibenzofuran	~	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Dibutyl phthalate	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Diethyl phthalate	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dimethyl phthalate	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dioctyl phthalate	50	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	U	5	U	5	UJ
Fluoranthene	50	0.1	U	0.1	U	0.59		0.42		0.38		0.1	U	0.05	J	0.04	J	0.1	U
Fluorene	50	0.02	J	0.02	J	0.05	J	0.74		0.58		0.1	U	0.2	U	0.2	U	0.1	U
Hexachlorobenzene	0.04	*0.8*	U	*0.8*	U	*0.8*	U	*0.8*	U	*0.8*	U	*0.8*	U	*0.8*	U	*0.8*	U	*0.8*	U
Hexachlorobutadiene	0.5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Hexachlorocyclopentadiene	5	*20*	U	*20*	U	*20*	U	*20*	U	*20*	U	*20*	U	*20*	UJ	*20*	UJ	*20*	U
Hexachloroethane	5	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
Indeno(1,2,3-cd)pyrene	0.002	*0.1*	U	*0.1*	U	**0.19**		*0.1*	U	*0.1*	U	*0.1*	U	*0.2*	U	*0.2*	U	*0.1*	U
Isophorone	50	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Naphthalene	10	0.06	J	0.11		0.08	J	0.12		0.1	J	0.1	U	0.2	U	0.2	U	0.1	U
Nitrobenzene	0.4	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U
n-Nitrosodi-N-Propylamine	~	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
n-Nitrosodiphenylamine	50	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Pentachlorophenol	1	0.8	U	0.8	U	0.8	U	0.12	J	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U
Phenanthrene	50	0.07	J	0.08	J	0.55		2.1		1.7		0.05	J	0.1	J	0.1	J	0.1	U
Phenol	1	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U	*5*	U
Pyrene	50	0.1	U	0.1	U	0.51		0.4		0.35		0.02	J	0.2	U	0.2	U	0.1	U

Notes provided on Page 5.

Table 2A
Remedial Action Work Plan
Groundwater Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location	NYSDEC	LMW-1		LMW-2		LMW-3		LMW-4		LMW-4		LMW-5		MW11		MW11		MW-11	
Sample ID	SGVs	055_LMW-1		054_LMW-2		053_LMW-3		048_LMW-4		049_DUP-1		047_LMW-5		MW11_053015		GWDUP01_053015		056_MW11	
Laboratory ID		L2123074-03		L2123074-02		L2123074-01		L2122822-02		L2122822-03		L2122822-01		L1511932-07		L1511932-08		L2123074-04	
Sample Date		5/4/2021		5/4/2021		5/4/2021		5/3/2021		5/3/2021		5/3/2021		5/30/2015		5/30/2015		5/4/2021	
Pesticides (µg/L)																			
4,4'-DDD	0.3	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	NA		NA		0.029	UJ
4,4'-DDE	0.2	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	NA		NA		0.029	UJ
4,4'-DDT	0.2	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	NA		NA		0.029	UJ
Aldrin	0	*0.014*	U	*0.014*	U	*0.014*	U	*0.014*	UJ	*0.014*	UJ	*0.014*	UJ	NA		NA		*0.014*	U
Alpha BHC (Alpha Hexachlorocyclohexane)	0.01	*0.014*	U	*0.014*	U	*0.014*	U	*0.014*	U	*0.014*	U	*0.014*	U	NA		NA		*0.014*	U
Alpha Chlordane	~	0.014	UJ	0.014	UJ	0.014	UJ	0.014	U	0.014	U	0.014	U	NA		NA		0.014	UJ
Alpha Endosulfan	~	0.014	UJ	0.014	UJ	0.014	UJ	0.014	UJ	0.014	UJ	0.014	UJ	NA		NA		0.014	UJ
Beta Bhc (Beta Hexachlorocyclohexane)	0.04	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	NA		NA		0.014	U
Beta Endosulfan	~	0.029	UJ	0.029	UJ	0.029	UJ	0.029	U	0.029	U	0.029	U	NA		NA		0.029	UJ
Chlordane (alpha and gamma)	0.05	*0.143*	U	*0.143*	U	*0.143*	U	*0.143*	U	*0.143*	U	*0.143*	U	NA		NA		*0.143*	U
Delta Bhc (Delta Hexachlorocyclohexane)	0.04	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	NA		NA		0.014	U
Dieldrin	0.004	*0.029*	UJ	*0.029*	UJ	*0.029*	UJ	*0.029*	UJ	*0.029*	UJ	*0.029*	UJ	NA		NA		*0.029*	UJ
Endosulfan Sulfate	~	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	NA		NA		0.029	UJ
Endrin	0	*0.029*	UJ	*0.029*	UJ	*0.029*	UJ	*0.029*	UJ	*0.029*	UJ	*0.029*	UJ	NA		NA		*0.029*	UJ
Endrin Aldehyde	5	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	NA		NA		0.029	UJ
Endrin Ketone	5	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	0.029	UJ	NA		NA		0.029	UJ
Gamma Bhc (Lindane)	0.05	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	NA		NA		0.014	U
Gamma Chlordane	~	0.014	UJ	0.014	UJ	0.014	UJ	0.014	U	0.014	U	0.014	U	NA		NA		0.014	UJ
Heptachlor	0.04	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	0.014	U	NA		NA		0.014	U
Heptachlor Epoxide	0.03	0.014	UJ	0.014	UJ	0.014	UJ	0.014	U	0.014	U	0.014	U	NA		NA		0.014	UJ
Methoxychlor	35	0.143	UJ	0.143	UJ	0.143	UJ	0.143	UJ	0.143	UJ	0.143	UJ	NA		NA		0.143	UJ
Toxaphene	0.06	*0.143*	U	*0.143*	U	*0.143*	U	*0.143*	U	*0.143*	U	*0.143*	U	NA		NA		*0.143*	U
Herbicides (µg/L)																			
2,4,5-T (Trichlorophenoxyacetic Acid)	35	2	U	2	U	2	U	2	U	2	U	2	U	NA		NA		2	U
2,4-D (Dichlorophenoxyacetic Acid)	50	10	U	10	U	10	U	10	U	10	U	10	U	NA		NA		10	U
Silvex (2,4,5-Tp)	0.26	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	*2*	U	NA		NA		*2*	U
Polychlorinated Biphenyls (µg/L)																			
PCB-1016 (Aroclor 1016)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.083	U	0.083	U	0.071	U
PCB-1221 (Aroclor 1221)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.083	U	0.083	U	0.071	U
PCB-1232 (Aroclor 1232)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.083	U	0.083	U	0.071	U
PCB-1242 (Aroclor 1242)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.083	U	0.083	U	0.071	U
PCB-1248 (Aroclor 1248)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.083	U	0.083	U	0.071	U
PCB-1254 (Aroclor 1254)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.142	J	0.083	U	0.083	U	0.176	J
PCB-1260 (Aroclor 1260)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.083	U	0.083	U	0.071	U
PCB-1262 (Aroclor 1262)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.083	U	0.083	U	0.071	U
PCB-1268 (Aroclor 1268)	~	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	0.083	U	0.083	U	0.071	U
Total PCBs	0.09	0.071	U	0.071	U	0.071	U	0.071	U	0.071	U	**0.142**	B	0.083	U	0.083	U	**0.176**	B

Notes provided on Page 5.

Table 2A
Remedial Action Work Plan
Groundwater Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location	NYSDEC	LMW-1		LMW-2		LMW-3		LMW-4		LMW-4		LMW-5		MW11		MW11		MW-11	
Sample ID	SGVs	055_LMW-1		054_LMW-2		053_LMW-3		048_LMW-4		049_DUP-1		047_LMW-5		MW11_053015		GWDUP01_053015		056_MW11	
Laboratory ID		L2123074-03		L2123074-02		L2123074-01		L2122822-02		L2122822-03		L2122822-01		L1511932-07		L1511932-08		L2123074-04	
Sample Date		5/4/2021		5/4/2021		5/4/2021		5/3/2021		5/3/2021		5/3/2021		5/30/2015		5/30/2015		5/4/2021	
Inorganics (µg/L)																			
Aluminum	~	39.5	J	39.8	J	2,580		45.1	J	33.5	J	178		1,020		952		627	
Aluminum (Dissolved)	~	9.69	J	13.9		9.47	J	8.58	J	8.71	J	7.34	J	42	J	22	J	6.37	J
Antimony	3	*4*	U	0.6	J	*4*	U	*4*	U	*4*	U	0.75	J	2	U	2	U	*4*	U
Antimony (Dissolved)	3	*4*	U	*4*	U	*4*	U	*4*	U	*4*	U	*4*	U	1.6	J	0.9	J	*4*	U
Arsenic	25	0.86		1.02		2.45		1.14	J	1.08	J	0.7	J	1	J	1	J	0.95	
Arsenic (Dissolved)	25	0.8		0.96		0.64		0.94		0.92		0.65		0.5	U	0.5	U	0.71	
Barium	1,000	171		60.44		202.9		87.92		88.21		67.91		125.8		114.3		90.98	
Barium (Dissolved)	1,000	168.8		60.32		85.56		90.66		88.67		72.95		104.2		101.9		83.28	
Beryllium	3	0.5	U	0.5	U	0.15	J	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Beryllium (Dissolved)	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Cadmium	5	0.2	U	0.2	U	0.22		0.2	U	0.2	U	0.2	U	0.1	J	0.2	U	0.2	U
Cadmium (Dissolved)	5	0.2	U	0.2	U	0.08	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Calcium	~	94,100		58,900		80,900		84,200		83,800		75,400		67,000		53,100		66,400	
Calcium (Dissolved)	~	95,300		57,100		74,800		94,400		93,100		82,000		69,300		65,900		65,800	
Chromium, Hexavalent	50	10	U	10	U	10	U	10	U	10	U	10	U	NA		NA		10	U
Chromium, Total	50	0.28	J	0.61	J	10.3		0.68	J	0.5	J	0.92	J	**62.7**	J	41.1	J	3.43	
Chromium, Total (Dissolved)	50	1	U	0.52	J	0.66	J	1	U	0.21	J	1	U	4.1	J	1.7	J	1.97	
Chromium, Trivalent	~	10	U	10	U	10		10	U	10	U	10	U	NA		NA		10	U
Cobalt	~	0.85		0.67		3.27		0.66		0.61		1.03		2.1	J	1.4	J	0.98	
Cobalt (Dissolved)	~	0.84		0.63		0.71		0.56		0.48	J	0.84		0.4	J	0.3	J	0.5	U
Copper	200	1	U	1	U	10.11		1.43	J	1.5	J	1.57	J	7.3		6.1		1.95	
Copper (Dissolved)	200	1	U	1	U	1	U	0.72	J	0.73	J	0.81	J	1.7	J	5.9	J	1	U
Iron	300	146		88.3		**4,640**		148		97.1		**382**	J	**3,090**	J	**2,420**	J	**1,200**	
Iron (Dissolved)	300	74.6		24.2	J	50	U	50	U	50	U	50	U	58		37	J	50	U
Lead	25	0.51	J	1	U	**69.42**		8.61		6.93	J	1	U	2.2	J	1.7	J	1.14	
Lead (Dissolved)	25	1	U	1	U	1	U	3.01		3		1	U	1	U	0.1	J	1	U
Magnesium	35,000	31,600		13,300		25,000		27,600		26,600		23,300		29,300	J	24,300	J	25,500	
Magnesium (Dissolved)	35,000	31,600		14,600		23,200		29,000		28,100		25,500		26,200		23,800		25,000	
Manganese	300	**1,065**		**502.8**		**706.6**		199		185.1		**520.1**		160.6		130		85.06	
Manganese (Dissolved)	300	**1,202**		**512.6**		**559.4**		199.9		185.6		**508.3**		66.9		60.4		1.24	
Mercury	0.7	0.2	U	0.2	U	0.11	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Mercury (Dissolved)	0.7	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Nickel	100	2.86		3.4		16.05		2.28		2.02		5.13		39.2	J	23.6	J	1.71	J
Nickel (Dissolved)	100	3.09		2.94		2.68		2.11		1.85	J	3.38		7.5	J	4.2	J	2	U
Potassium	~	6,150		6,020		4,800		4,130		3,880		6,210		5,040		4,500		3,120	
Potassium (Dissolved)	~	6,770		5,920		4,250		4,390		4,300		5,980		4,490		4,240		2,980	
Selenium	10	1.78	J	5	U	5	U	2.39	J	2.24	J	5	U	1	J	1	J	5	U
Selenium (Dissolved)	10	5	U	5	U	5	U	2.36	J	2.38	J	1.88	J	5	U	5	U	5	U
Silver	50	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.1	J	0.2	J	0.4	U
Silver (Dissolved)	50	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	UJ	0.4	U
Sodium	20,000	**91,200**		**40,200**		**56,000**		**59,700**		**56,900**		**59,900**		**51,600**		**46,600**		**37,500**	
Sodium (Dissolved)	20,000	**91,100**		**41,000**		**57,300**		**63,000**		**61,200**		**64,700**		**62,800**		**54,200**		**37,800**	
Thallium	0.5	*1*	U	*1*	U	*1*	U	*1*	U	*1*	U	*1*	U	0.5	U	0.5	U	*1*	U
Thallium (Dissolved)	0.5	*1*	U	*1*	U	*1*	U	*1*	U	*1*	U	*1*	U	0.5	U	0.5	U	*1*	U
Vanadium	~	5	U	5	U	7.78		5	U	5	U	5	U	3.3	J	2.3	J	3.22	J
Vanadium (Dissolved)	~	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	1.83	J
Zinc	2,000	10	U	10	U	79.41		10	U	10	U	10	U	123.8		143.6		5.34	J
Zinc (Dissolved)	2,000	10	U	10	U	10.52	J	10	U	10	U	10	U	10	U	10	U	10	U

Notes provided on Page 5.

Table 2A
Remedial Action Work Plan
Groundwater Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Notes:
1. Groundwater sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules and Regulations (NYCRR) Part 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein collectively referenced as "NYSDEC SGVs").
2. Criterion comparisons for total xylenes and m,p-xylene are provided for reference. Promulgated NYSDEC SGVs are for o-xylene, m-xylene, and p-xylene.
3. Detected analytical results above NYSDEC SGVs are bolded and shaded.
4. Analytical results with reporting limits (RL) above NYSDEC SGVs are italicized.
5. Sample 049_DUP-1 is a duplicate sample of 048_LMW-4 and sample GWDUP01_053015 is a duplicate sample of MW11_053015.
6. ~ = Regulatory limit for this analyte does not exist
7. µg/l = micrograms per liter
8. NA = Not analyzed
9. ND = Not detected

Qualifiers:
B = The analyte was found in the associated analysis batch blank.
J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
U = The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Notes provided on Page 5.

Table 2B
Remedial Action Work Plan
Groundwater Sample Analytical Results - Emerging Contaminants

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location Sample ID Laboratory ID Sample Date	NYSDEC SGVs	Unit	LMW-1 055_LMW-1 L2123074-03 5/4/2021		LMW-2 054_LMW-2 L2123074-02 5/4/2021		LMW-3 053_LMW-3 L2123074-01 5/4/2021		LMW-4 048_LMW-4 L2122822-02 5/3/2021		LMW-4 049_DUP-1 L2122822-03 5/3/2021		LMW-5 047_LMW-5 L2122822-01 5/3/2021		MW-11 056_MW11 L2123074-04 5/4/2021	
Semivolatile Organic Compounds (ng/L)																
1,4-Dioxane (P-Dioxane)	1,000	ng/l	139	U	139	U	139	U	150	U	139	U	139	U	139	U
Per and Polyfluoroalkyl Substances (ng/L)																
N-ethyl perfluorooctane- sulfonamidoacetic Acid (NEtFOSAA)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
N-methyl perfluorooctane- sulfonamidoacetic Acid (NMeFOSAA)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
Perfluorobutanesulfonic Acid (PFBS)	NS	ng/l	4.85		1.46	J	1.84		4.59		4.49		3.86		1.42	J
Perfluorobutanoic acid (PFBA)	NS	ng/l	10.4		1.9		3.49		8.43	J	8.04	J	7.22		2.31	
Perfluorodecanesulfonic Acid (PFDS)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
Perfluorodecanoic Acid (PFDA)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	UJ	1.89	UJ	1.8	U	1.77	U
Perfluorododecanoic Acid (PFDoA)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
Perfluoroheptanesulfonic Acid (PFHpS)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
Perfluoroheptanoic acid (PFHpA)	NS	ng/l	14.2		2.92		4.35		9.87	J	9.67	J	8.73		3.83	
Perfluorohexanesulfonic Acid (PFHxS)	NS	ng/l	4.29		1.46	J	2.67		4.24		4.05		3.5		1.84	
Perfluorohexanoic Acid (PFHxA)	NS	ng/l	16.4		3.71	J	5.5		11.2	J	11	J	12.1		4.24	J
Perfluorononanoic Acid (PFNA)	NS	ng/l	0.409	J	0.312	J	0.487	J	1.78	UJ	1.89	UJ	0.462	J	1.77	U
Perfluorooctanesulfonamide (FOSA)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
Perfluorooctanesulfonic Acid (PFOS)	2.7	ng/l	**12.7**		**4.25**		**8.66**		**5.11**		**4.96**		**7.7**		**3.61**	
Perfluorooctanoic Acid (PFOA)	6.7	ng/l	**59.3**		**19.7**		**29**		**61.8**	J	**60**	J	**45.5**		**27.1**	
Perfluoropentanoic Acid (PFPeA)	NS	ng/l	23.6		4.08		6.42		14.9	J	14.3		16.3		4.5	
Perfluorotetradecanoic Acid (PFTA)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
Perfluorotridecanoic Acid (PFTrDA)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
Perfluoroundecanoic Acid (PFUnA)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	UJ	1.89	U	1.8	U	1.77	U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2) (8:2FTS)	NS	ng/l	1.81	U	1.79	U	1.83	U	1.78	U	1.89	U	1.8	U	1.77	U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2) (6:2FTS)	NS	ng/l	1.81	U	1.79	U	1.48	J	4.68		4.03		12.3		1.77	U
Total PFOA and PFOS	NS	ng/l	72		24		37.7		66.9		65		53.2		30.7	
Total PFAS	NS	ng/l	146		39.8		63.9		125		121		118		48.9	

Notes:

1. Groundwater sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules and Regulations (NYCRR) Part 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein collectively referenced as "NYSDEC SGVs").
2. Detected analytical results above NYSDEC SGVs are bolded and shaded.
3. Analytical results with reporting limits (RL) above NYSDEC SGVs are italicized.
4. Sample 049_DUP-1 is a duplicate sample of 048_LMW-4.
5. ~ = Regulatory limit for this analyte does not exist
6. ng/l = nanograms per liter

Qualifiers:

J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.

U = The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Table 3
Remedial Action Work Plan
Soil Vapor Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Location	NYSDOH Decision Matrices Minimum Concnetrations	Unit	AMB	SV01	SV02	SV03	AMBIENT-1	LSV-1	LSV-1	LSV-2	LSV-2	LSV-3	LSV-3	LSV-4	LSV-4	LSV-5	LSV-5	LSV-6	LSV-6	LSV-7	LSV-7	LSV-7	LSV-8	LSV-8	LSV-8
Sample ID			AMB_053015	SV01_053021	SV02_053021	SV03_053021	030_AMBIENT-1	045_LSV-1	046_DUP-1	043_LSV-2A	044_LSV-2B	035_LSV-3A	036_LSV-3B	041_LSV-4A	042_LSV-4B	033_LSV-5A	034_LSV-5B	031_LSV-6A	032_LSV-6B	037_LSV-7A	038_LSV-7B	039_LSV-8A	040_LSV-8B
Laboratory ID			L1511934-04	L1511934-01	L1511934-02	L1511934-03	L2123062-01	L2123062-16	L2123062-17	L2123062-14	L2123062-15	L2123062-06	L2123062-07	L2123062-12	L2123062-13	L2123062-04	L2123062-05	L2123062-02	L2123062-03	L2123062-08	L2123062-09	L2123062-10	L2123062-11
Sample Date			5/30/2015	5/30/2015	5/30/2015	5/30/2015	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021	5/4/2021
sample Type			AA	SV	SV	SV	AA	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV	SV
Volatile Organic Compounds (µg/m³)																									
1,1,1-Trichloroethane	100	ug/m3	1.09 U	2.73 U	3.64 U	1.3	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	3.03 U	2.73 U	1.09 U	1.6 U	1.82 U	4.96 U	3.9 U	10.9 U	1.09 U	2.73 U	1.09 U	1.09 U		
1,1,2,2-Tetrachloroethane	~	ug/m3	1.37 U	3.43 U	4.58 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	3.82 U	3.43 U	1.37 U	2.02 U	2.29 U	6.24 U	4.9 U	13.7 U	1.37 U	3.43 U	1.37 U	1.37 U		
1,1,2-Trichloro-1,2,2-Trifluoroethane	~	ug/m3	1.53 U	3.83 U	5.11 U	1.53 U	1.53 U	1.53 U	1.53 U	1.53 U	1.53 U	4.26 U	3.83 U	1.53 U	2.25 U	2.55 U	6.97 U	5.47 U	15.3 U	1.53 U	3.83 U	1.53 U	1.53 U		
1,1,2-Trichloroethane	~	ug/m3	1.09 U	2.73 U	3.64 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	3.03 U	2.73 U	1.09 U	1.6 U	1.82 U	4.96 U	3.9 U	10.9 U	1.09 U	2.73 U	1.09 U	1.09 U		
1,1-Dichloroethane	~	ug/m3	0.809 U	2.02 U	2.7 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	2.25 U	2.02 U	0.809 U	1.19 U	1.35 U	3.68 U	2.89 U	8.09 U	0.809 U	2.02 U	0.809 U	0.809 U		
1,1-Dichloroethene	6	ug/m3	0.793 U	1.98 U	2.64 U	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	2.2 U	1.98 U	0.793 U	1.17 U	1.32 U	3.6 U	2.83 U	*7.93* U	0.793 U	1.98 U	0.793 U	0.793 U		
1,2,4-Trichlorobenzene	~	ug/m3	1.48 U	3.71 U	4.95 U	1.48 U	1.48 UJ	1.48 UJ	1.48 UJ	1.48 UJ	1.48 UJ	4.13 UJ	3.71 UJ	1.48 UJ	2.18 UJ	2.47 UJ	6.75 UJ	5.3 UJ	14.8 UJ	1.48 UJ	3.71 UJ	1.48 UJ	1.48 UJ		
1,2,4-Trimethylbenzene	~	ug/m3	1.36	86.5	80.1	64.4	0.983 U	4.49	6	9	10.6	48.6	41.8 J	24.9	13.3	42.1	41.7	38.1	53.1	232	320	190 J	9.73		
1,2-Dibromoethane (Ethylene Dibromide)	~	ug/m3	1.54 U	3.84 U	5.13 U	1.54 U	1.54 U	1.54 U	1.54 U	1.54 U	1.54 U	4.27 U	3.84 U	1.54 U	2.26 U	2.56 U	6.99 U	5.49 U	15.4 U	1.54 U	3.84 U	1.54 U	1.54 U		
1,2-Dichlorobenzene	~	ug/m3	1.2 U	3.01 U	4.01 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	3.34 U	3.01 U	1.2 U	1.77 U	2 U	5.47 U	4.29 U	12 U	1.2 U	3.01 U	1.2 U	1.2 U		
1,2-Dichloroethane	~	ug/m3	0.809 U	2.02 U	2.7 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	2.25 U	2.02 U	0.809 U	1.19 U	1.35 U	3.68 U	2.89 U	8.09 U	0.809 U	2.02 U	0.809 U	0.809 U		
1,2-Dichloropropane	~	ug/m3	0.924 U	2.31 U	3.08 U	0.924 U	0.924 U	0.924 U	0.924 U	0.924 U	0.924 U	2.57 U	2.31 U	0.924 U	1.36 U	1.54 U	4.2 U	3.3 U	9.24 U	0.924 U	2.31 U	0.924 U	0.924 U		
1,2-Dichlorotetrafluoroethane	~	ug/m3	1.4 U	3.49 U	4.66 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	3.89 U	3.49 U	1.4 U	2.05 U	2.33 U	6.35 U	4.99 U	14 U	1.4 U	3.49 U	1.4 U	1.4 U		
1,3,5-Trimethylbenzene (Mesitylene)	~	ug/m3	0.983 U	24	23.6	16	0.983 U	1.33	1.73	2.22	2.92	15.1	14.3 J	6.64	3.92	13.2	15.2	12.5	29.3	67.4	95.4	52.6 J	2.69		
1,3-Butadiene	~	ug/m3	0.442 U	1.57	2.39	0.442 U	0.442 U	0.442 U	0.442 U	0.442 U	0.642	1.23 U	1.11 U	0.442 U	0.801	0.737 U	2.01 U	1.58 U	4.42 U	0.442 U	1.11 U	0.442 U	0.456		
1,3-Dichlorobenzene	~	ug/m3	1.2 U	3.01 U	4.01 U	4.6	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	3.34 U	3.01 U	1.2 U	1.77 U	2 U	5.47 U	4.29 U	12 U	1.2 U	3.01 U	1.2 U	1.2 U		
1,4-Dichlorobenzene	~	ug/m3	1.2 U	3.01 U	4.01 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	3.34 U	3.01 U	1.2 U	1.77 U	2 U	5.47 U	4.29 U	12 U	1.2 U	3.01 U	1.2 U	1.2 U		
1,4-Dioxane (P-Dioxane)	~	ug/m3	0.721 U	1.8 U	2.4 U	0.721 U	0.721 U	0.721 U	0.721 U	0.721 U	0.721 U	2 U	1.8 U	0.721 U	1.06 U	1.2 U	3.28 U	2.57 U	7.21 U	0.721 U	1.8 U	0.721 U	0.721 U		
2,2,4-Trimethylpentane	~	ug/m3	5.56	2.34 UJ	9.81	7.38	0.934 U	0.934 U	0.934 U	0.934 U	1.46	7.52	11.8 J	0.934 U	1.37 U	1.56 U	6.73	3.33 U	24.3	0.934 U	8.17	0.934 U	0.934 U		
2-Hexanone (MBK)	~	ug/m3	0.82 U	2.05 U	2.73 U	0.82 U	0.82 U	2.46	2.82	3.83	10.2	59	88.9 J	43.9	36.6	48.4	83.2	56.1	109	34.5	66.4	4.75 J	8.44		
4-Ethyltoluene	~	ug/m3	0.983 U	16	15.8	11.7	0.983 U	1.15	1.48	1.91	3.02	12.2	10.2 J	6.24	3.34	10.1	11.3	7.37	11.5	47.6	70.8	37.8 J	2.87		
Acetone	~	ug/m3	13.5	82 J	152 J	137	6.49	3.21	2.42	3.75	5.46	92.9	91.2 J	9.17	95.5	57.7	177	139	606	19.6	58.4	4.99 J	5.75		
Allyl Chloride (3-Chloropropene)	~	ug/m3	0.626 U	1.57 U	2.09 U	0.626 U	0.626 U	0.626 U	0.626 U	0.626 U	0.626 U	1.74 U	1.57 U	0.626 U	0.92 U	1.04 U	2.85 U	2.23 U	6.26 U	0.626 U	1.57 U	0.626 U	0.626 U		
Benzene	~	ug/m3	0.639 U	4.34	4.7	2.3	0.639 U	0.639 U	0.639 U	0.639 U	1.34	1.78 U	1.6 U	0.639 U	0.939 U	1.06 U	2.9 U	2.28 U	6.39 U	0.639 U	2.42	0.639 U	0.639 U		
Benzyl Chloride	~	ug/m3	1.04 U	2.59 U	3.45 U	1.04 U	1.04 UJ	1.04 UJ	1.04 UJ	1.04 UJ	1.04 UJ	2.88 UJ	2.59 UJ	1.04 UJ	1.52 UJ	1.72 UJ	4.71 UJ	3.7 UJ	10.4 UJ	1.04 UJ	2.59 UJ	1.04 UJ	1.04 UJ		
Bromodichloromethane	~	ug/m3	1.34 U	3.35 U	4.47 U	1.34 U	1.34 U	1.34 U	1.34 U	1.34 U	1.34 U	3.72 U	3.35 U	1.34 U	1.97 U	2.23 U	6.09 U	4.78 U	13.4 U	1.34 U	3.35 U	1.34 U	1.34 U		
Bromoethene	~	ug/m3	0.874 U	2.19 U	2.92 U	0.874 U	0.874 U	0.874 U	0.874 U	0.874 U	0.874 U	2.43 U	2.19 U	0.874 U	1.29 U	1.46 U	3.97 U	3.12 U	8.74 U	0.874 U	2.19 U	0.874 U	0.874 U		
Bromoform	~	ug/m3	2.07 U	5.17 U	6.9 U	2.07 U	2.07 U	2.07 U	2.07 U	2.07 U	2.07 U	5.75 U	5.17 U	2.07 U	3.04 U	3.44 U	9.4 U	7.38 U	20.7 U	2.07 U	5.17 U	2.07 U	2.07 U		
Bromomethane	~	ug/m3	0.777 U	1.94 U	2.59 U	0.777 U	0.777 U	0.777 U	0.777 U	0.777 U	0.777 U	2.16 U	1.94 U	0.777 U	1.14 U	1.29 U	3.53 U	2.77 U	7.77 U	0.777 U	1.94 U	0.777 U	0.777 U		
Carbon Disulfide	~	ug/m3	0.623 U	442	679	15.3	0.623 U	5.64	6.57	1.23	10.2	1.73 U	6.76 J	1.33	13.8	1.04 U	2.91	2.22 U	6.23 U	0.623 U	4.2	0.623 U	8.41		
Carbon Tetrachloride	6	ug/m3	1.26 U	3.15 U	4.2 U	1.26 U	1.26 U	1.26 U	1.26 U	1.26 U	1.26 U	3.5 U	3.15 U	1.26 U	1.85 U	2.09 U	5.72 U	4.49 U	*12.6* U	1.26 U	3.15 U	1.26 U	1.26 U		
Chlorobenzene	~	ug/m3	0.921 U	2.3 U	3.07 U	0.921 U	0.921 U	0.921 U	0.921 U	0.921 U	0.921 U	2.56 U	2.3 U	0.921 U	1.35 U	1.53 U	4.19 U	3.29 U	9.21 U	0.921 U	2.3 U	0.921 U	0.921 U		
Chloroethane	~	ug/m3	0.528 U	1.32 U	1.76 U	0.528 U	0.528 U	0.528 U	0.528 U	0.528 U	0.528 U	1.47 U	1.32 U	0.528 U	0.776 U	0.879 U	2.4 U	1.88 U	5.28 U	0.528 U	1.32 U	0.528 U	0.528 U		
Chloroform	~	ug/m3	0.977 U	2.44 U	3.26 U	1.02	0.977 U	4.93	5.27	0.977 U	0.977 U	2.72 U	17.4 J	0.977 U	1.44 U	1.63 U	28.2	3.49 U	10.3	0.977 U	5.57	0.977 U	0.977 U		
Chloromethane	~	ug/m3	1.31	1.03 U	1.38 U	1.18	1.14	0.413 U	0.413 U	0.413 U	0.52	1.15 U	1.03 U	0.413 U	0.717	0.688 U	1.88 U	1.47 U	4.13 U	0.413 U	1.03 U	0.413 U	0.611		
Cis-1,2-Dichloroethene	6	ug/m3	0.793 U	1.98 U	2.64 U	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	2.2 U	1.98 U	0.793 U	1.17 U	1.32 U	3.6 U	2.83 U	*7.93* U	0.793 U	1.98 U	0.793 U	0.793 U		
Cis-1,3-Dichloropropene	~	ug/m3	0.908 U	2.27 U	3.03 U	0.908 U	0.908 U	0.908 U	0.908 U	0.908 U	0.908 U	2.52 U	2.27 U	0.908 U	1.33 U	1.51 U	4.13 U	3.24 U	9.08 U	0.908 U	2.27 U	0.908 U	0.908 U		
Cyclohexane	~	ug/m3	0.688 U	13.8	7.74	2.03	0.688 U	0.688 U	0.688 U	0.688 U	0.688 U	3.32	4.68 J	0.688 U	1.94	1.15 U	3.35	2.46 U	8.16	0.688 U	3.58	0.688 U	0.688 U		
Dibromochloromethane	~	ug/m3	1.7 U	4.26 U	5.68 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	4.74 U	4.26 U	1.7 U	2.5 U	2.84 U	7.74 U	6.08 U	17 U	1.7 U	4.26 U	1.7 U	1.7 U		
Dichlorodifluoromethane	~	ug/m3	1.05 J	2.47 UJ	3.3 UJ	1.68 J	2.29	2.31	2.26	2.25	2.23	2.75 U	2.47 U	2.25	2.29	2.26	4.49 U	3.53 U	9.89 U	2.13	2.47 U	2.31 J	2.12		
Ethanol	~	ug/m3	12.9	27.5	69.5	164	17	9.42 U	9.42 U	9.42 U	9.42 U	26.2 U	23.6 U	9.42 U	18.1	15.7 U	42.8 U	33.5 U	94.2 U	14.9	36.6	9.42 U	9.42 U		
Ethyl Acetate	~	ug/m3	1.8 U	4.5 U	6.02 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	5.01 U	4.5 U	1.8 U	2.65 U	3.01 U	8.18 U	6.41 U	18 U	1.8 U	4.5 U	1.8 U	1.8 U		
Ethylbenzene	~	ug/m3	0.869 U	17.2	21.1	11.9	0.869 U	0.869 U	0.895	0.869 U	3.16	6.52	10.9 J	4.1	4.02	3.97	10.3	4.78	12.4	21.6	61.7	11.3 J	3.23		
Hexachlorobutadiene	~	ug/m3	2.13 U	5.33 U	7.11 U	2.13 U	2.13 U	2.13 U	2.13 U	2.13 U	2.13 U	5.93 U	5.33 U	2.13 U	3.14 U	3.55 U	9.7 U	7.62 U	21.3 U	2.13 U	5.33 U	2.13 U	2.13 U		
Isopropanol	~	ug/m3	1.98	8.41	14.1	28.3	3.37	1.91	1.76	1.23 U	1.23 U	3.42 U	3.07 U	1.23 U	1.81 U	2.05 U	5.58 U	4.38 U	12.3 U	1.23 U	3.07 U	1.23 U	1.23 U		
M,P-Xylene	~	ug/m3	2.81	81.7	93	53	1.74 U	3.54	3.83	2.63	12.2	27.4	40.9 J	17.5	13.5	19.3	41	20.9	42.7	96	228	57.3 J	12.5		
Methyl Ethyl Ketone (2-Butanone)	~	ug/m3	1.47 U	11.7	37.8	6.61	1.47 U	12.7	12.8	31.6	36	602	560 J	165	307	378	1,000	684	2,000	150	513	30.1 J	54.9		
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	~	ug/m3	2.05 U	5.66	15.5	2.05 U	2.05 U	2.05 U	2.05 U	2.05 U	2.05 U	5.7 U	5.12 U	2.05 U	3.01 U	3.42 U	9.3 U	7.29 U	20.5 U	2.05 U	5.12 U	2.05 U	2.05 U		
Methylene Chloride	100	ug/m3	1.74 U	4.34 U	5.8 U	1.74 U	1.74 U	1.74 U	1.74 U	1.74 U	1.74 U	4.83 U	4.34 U	1.74 U	2.55 U	2.9 U	7.89 U	6.18 U	17.4 U	1.74 U	4.34 U	1.74 U	1.74 U		
n-Heptane	~	ug/m3	1.05	8.77	22.5	4.34	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	3.96	6.97 J	1.91	2.86	1.73	6.27	3.75	12	3.4	12.7	0.82 U	0.82 U		
n-Hexane	~	ug/m3	0.835	13.9	49.3	2.97	0.705 U	0.705 U	0.705 U	0.705 U	0.969	3.13	4.72 J	1.42	2.48	1.17 U	3.74	2.69	10.2	1.96	7.4	0.705 U	0.705 U		
o-Xylene (1,2-Dimethylbenzene)	~	ug/m3	1.06	37.4	43.9	26.1	0.869 U	1.87	2.11	1.64	6.08	17.6	24.8 J	8.77	7.12	12.4	24	13.5	36.7	55.2	120	35.1 J	6.08		
Styrene	~	ug/m3	0.852 U	38.5	35.3	24.4	0.852 U	0.852 U	0.852 U	0.852 U	0.852 U	2.37 U	2.13 U	0.852 U	1.25 U	1.42 U	3.87 U	3.04 U	8.52 U	0.852 U	2.13 U	0.852 U	0.852 U		
Tert-Butyl Alcohol	~	ug/m3	1.52 U	24.3	25.5	59.1	1.52 U	1.52 U	1.52 U	1.52 U	1.52 U	4.21 U	3.79 U	1.52 U	2.23 U	2.53 U	6.88 U	5.4 U	15.2 U	2.88	3.79 U	1.52 U	1.52 U		
Tert-Butyl Methyl Ether	~	ug/m3	0.721 U	1.8 U	2.4 U	0.721 U	0.721 U	0.721 U	0.721 U	0.721 U	0.721 U	2 U	1.8 U	0.721 U	1.06 U	1.2 U	3.28 U	2.57 U	7.21 U	0.721 U	1.8 U	0.721 U	0.721 U		
Tetrachloroethene (PCE)	100	ug/m3	1.36 U	3.39 U	7.87	3.04	1.36 U	2.5	2.85	1.36 U	1.63	18.4	33.8 J	3.35	1.99 U	9.02	30.2	12	36.3	5.79	16.4	2.91 J	1.81		
Tetrahydrofuran	~	ug/m3	1.47 U	3.69 U	20.2	1.77	1.47 U	21.3	21.1	1.47 U	3.66	4.1 U	3.69 U	5.4	9.26	2.46 U	6.69 U	5.25 U	14.7 U	1.47 U	3.69 U	1.47 U	5.01		
Toluene	~	ug/m3	4.11	43.3	41.8	27.2	1.34	1.05	1.01	0.754 U	5.58	8.67	17.3 J	6.22	10.3	3.16	16.6	6.26	21.7	23.1	106	7.2 J	4.26		
Total Xylenes	~	ug/m3	3.87	119.1	136.9	79.1	0.869 U	5.39	5.95	4.27	18.2	45.2	65.6 J	26.3	20.6	31.8	65.2	34.4	79.5	151	348	92.5 J	18.6		
Trans-1,2-Dichloroethene	~	ug/m3	0.793 U	1.98 U	2.64 U	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	0.793 U	2.2 U	1.98 U	0.793 U	1.17 U	1.32 U	3.6 U	2.83 U	7.93 U	0.793 U	1.98 U	0.793 U	0.793 U		
Trans-1,3-Dichloropropene	~	ug/m3	0.908 U	2.27 U	3.03 U	0.908 U	0.908 U	0.908 U	0.908 U	0.908 U	0.908 U	2.52 U	2.27 U	0.908 U	1.33 U	1.51 U	4.13 U	3.24 U	9.08 U	0.908 U	2.27 U	0.908 U	0.908 U		
Trichloroethene (TCE)	6	ug/m3	1.07 U	2.69 U	3.58 U	1.07 U	1.07 U	1.22	1.24	1.07 U	1.07 U	2.99 U	2.69 U	1.07 U	1.58 U	1.79 U	4.89 U	3.84 U	*10.7* U	**6.99**	**18.9**	1.07 U	1.07 U		
Trichlorofluoromethane	~	ug/m3	2.44	2.81 U	3.75 U	1.55	1.12 U	1.18	1.2	1.17	1.15	3.12 U	2.81 U	1.27	1.65 U	1.87 U	5.11 U	4.01 U	11.2 U	1.16	2.81 U	1.12 U	1.12 U		
Vinyl Chloride	6	ug/m3	0.511 U	1.28 U	1.71 U	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	1.42 U	1.28 U	0.511 U	0.752 U	0.851 U	2.32 U	1.83 U	5.11 U	0.511 U	1.28 U	0.511 U	0.511 U		
Total BTEX	~		7.98	184	205	121	1.34	6.46	7.85	4.27	28.4	60.2	93.9	36.6	34.9	38.8	91.9	45.4	114	196	518	111	26.1		
Total CVOCs	~		ND	ND	7.87	4.34	ND	3.72	4.09	ND	1.63	18.4	33.8	3.35	ND	9.02	30.2	12	36.3	12.8	35.3	2.91	1.81		

Notes:

1. Soil vapor sample analytical results are compared to the minimum soil vapor concentrations at which mitigation is recommended as set forth in the New York State Department of Health (NYSDOH) October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York Decision Matrices for Sub-Slab Vapor and Indoor Air and subsequent updates (2017).
2. Ambient air sample analytical results are shown for reference only.
3. Detected analytical results above the minimum soil vapor concentrations recommending mitigation are bolded and shaded.
4. Analytical results with reporting limits (RL) above the minimum soil vapor concentrations recommending mitigation are italicized.
5. Sample 046_DUP-1 is a duplicate of parent sample 045_LSV-1.
6. ~ = Regulatory limit for this analyte does not exist
7. µg/m³ = micrograms per cubic meter
8. AA = Ambient Air
9. SV = Soil Vapor

Qualifiers:

J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
U = The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Table 3
Remedial Action Work Plan
Soil Vapor Sample Analytical Results

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Notes:

1. Soil vapor sample analytical results are compared to the minimum soil vapor concentrations at which mitigation is recommended as set forth in the New York State Department of Health (NYSDOH) October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York Decision Matrices for Sub-Slab Vapor and Indoor Air and subsequent updates (2017).
2. Ambient air sample analytical results are shown for reference only.
3. Detected analytical results above the minimum soil vapor concentrations recommending mitigation are bolded and shaded.
4. Analytical results with reporting limits (RL) above the minimum soil vapor concentrations recommending mitigation are italicized.
5. Sample 046_DUP-1 is a duplicate of parent sample 045_LSV-1.
6. ~ = Regulatory limit for this analyte does not exist
7. µg/m³ = micrograms per cubic meter
8. AA = Ambient Air
9. SV = Soil Vapor

Qualifiers:

J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected at a level greater than or equal to the RL; however, the reported RL is approximate and may be inaccurate or imprecise.
U = The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the RL or the sample concentration for results impacted by blank contamination.

Table 4
Remedial Action Work Plan
Soil Cleanup Objectives

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Analyte	CAS Number	Track 1 SCOs (Unrestricted Use SCOs)	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
Volatile Organic Compounds (mg/kg)			
1,1,1-Trichloroethane	71-55-6	0.68	100
1,1-Dichloroethane	75-34-3	0.27	26
1,1-Dichloroethene	75-35-4	0.33	100
1,2,4-Trimethylbenzene	95-63-6	3.6	52
1,2-Dichlorobenzene	95-50-1	1.1	100
1,2-Dichloroethane	107-06-2	0.02	3.1
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	8.4	52
1,3-Dichlorobenzene	541-73-1	2.4	49
1,4-Dichlorobenzene	106-46-7	1.8	13
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13
Acetone	67-64-1	0.05	100
Benzene	71-43-2	0.06	4.8
Carbon Tetrachloride	56-23-5	0.76	2.4
Chlorobenzene	108-90-7	1.1	100
Chloroform	67-66-3	0.37	49
Cis-1,2-Dichloroethene	156-59-2	0.25	100
Ethylbenzene	100-41-4	1	41
Hexachlorobenzene	118-74-1	0.33	1.2
Methyl Ethyl Ketone (2-Butanone)	78-93-3	0.12	100
Methylene Chloride	75-09-2	0.05	100
Naphthalene	91-20-3	12	100
n-Butylbenzene	104-51-8	12	100
n-Propylbenzene	103-65-1	3.9	100
Sec-Butylbenzene	135-98-8	11	100
T-Butylbenzene	98-06-6	5.9	100
Tert-Butyl Methyl Ether	1634-04-4	0.93	100
Tetrachloroethene (PCE)	127-18-4	1.3	19
Toluene	108-88-3	0.7	100
Total Xylenes	1330-20-7	0.26	100
Trans-1,2-Dichloroethene	156-60-5	0.19	100
Trichloroethene (TCE)	79-01-6	0.47	21
Vinyl Chloride	75-01-4	0.02	0.9
Semivolatile Organic Compounds (mg/kg)			
1,2-Dichlorobenzene	95-50-1	1.1	100
1,3-Dichlorobenzene	541-73-1	2.4	49
1,4-Dichlorobenzene	106-46-7	1.8	13
1,4-Dioxane (P-Dioxane)	123-91-1	0.1	13
2-Methylphenol (o-Cresol)	95-48-7	0.33	100
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	0.33	100
Acenaphthene	83-32-9	20	100
Acenaphthylene	208-96-8	100	100
Anthracene	120-12-7	100	100
Benzo(a)anthracene	56-55-3	1	1
Benzo(a)pyrene	50-32-8	1	1
Benzo(b)fluoranthene	205-99-2	1	1
Benzo(g,h,i)Perylene	191-24-2	100	100
Benzo(k)fluoranthene	207-08-9	0.8	3.9
Chrysene	218-01-9	1	3.9
Dibenz(a,h)anthracene	53-70-3	0.33	0.33
Dibenzofuran	132-64-9	7	59
Fluoranthene	206-44-0	100	100
Fluorene	86-73-7	30	100
Hexachlorobenzene	118-74-1	0.33	1.2
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	0.5
Naphthalene	91-20-3	12	100
Pentachlorophenol	87-86-5	0.8	6.7
Phenanthrene	85-01-8	100	100
Phenol	108-95-2	0.33	100
Pyrene	129-00-0	100	100

Notes provided on Page 2.

Table 4
Remedial Action Work Plan
Soil Cleanup Objectives

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Analyte	CAS Number	Track 1 SCOs (Unrestricted Use SCOs)	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
Pesticides (mg/kg)			
4,4'-DDD	72-54-8	0.0033	13
4,4'-DDE	72-55-9	0.0033	8.9
4,4'-DDT	50-29-3	0.0033	7.9
Aldrin	309-00-2	0.005	0.097
Alpha BHC (Alpha Hexachlorocyclohexane	319-84-6	0.02	0.48
Alpha Chlordane	5103-71-9	0.094	4.2
Alpha Endosulfan	959-98-8	2.4	24
Beta Bhc (Beta Hexachlorocyclohexane)	319-85-7	0.036	0.36
Beta Endosulfan	33213-65-9	2.4	24
Delta Bhc (Delta Hexachlorocyclohexane)	319-86-8	0.04	100
Dibenzofuran	132-64-9	7	59
Dieldrin	60-57-1	0.005	0.2
Endosulfan Sulfate	1031-07-8	2.4	24
Endrin	72-20-8	0.014	11
Gamma Bhc (Lindane)	58-89-9	0.1	1.3
Heptachlor	76-44-8	0.042	2.1
Herbicides (mg/kg)			
Silvex (2,4,5-Tp)	93-72-1	3.8	100
Polychlorinated Biphenyls (mg/kg)			
Total PCBs	1336-36-3	0.1	1
Inorganics (mg/kg)			
Arsenic	7440-38-2	13	16
Barium	7440-39-3	350	400
Beryllium	7440-41-7	7.2	72
Cadmium	7440-43-9	2.5	4.3
Chromium, Hexavalent	18540-29-9	1	110
Chromium, Trivalent	16065-83-1	30	180
Copper	7440-50-8	50	270
Total Cyanide	~	27	27
Lead	7439-92-1	63	400
Manganese	7439-96-5	1,600	2,000
Mercury	7439-97-6	0.18	0.81
Nickel	7440-02-0	30	310
Selenium	7782-49-2	3.9	180
Silver	7440-22-4	2	180
Zinc	7440-66-6	109	10,000

Notes:
1. Soil cleanup objectives taken from New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use and Restricted Use Restricted-Residential Soil Cleanup Objectives
2. Criterion comparisons for 3- & 4-methylphenol (m&p cresol) are provided for reference. Promulgated SCOs are for 3-methylphenol (m-cresol) and
3. ~ = Regulatory limit for this analyte does not exist
4. mg/kg = milligrams per kilogram

Table 5
Remedial Action Work Plan
Track 1 Remedial Cost Estimate

130 Saint Felix Street
Brooklyn, New York
Regulatory Site No.: C224306
Langan Project No.: 100842301

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SITE PREPARATION COST
CONTRACTOR FEES					
1	Demolition of asphalt	Allowance			$ 10,000.00
2	Remediation Facilities, Mobilization, Demobilization, and Site Maintenance - Remediation and decontamination facilities, site fencing, trailer, truck cleaning facilities, etc.	Allowance			$ 100,000.00
3	Management and Handling of Contaminated Material (Remedial Excavation)	5,800	CY	$ 30.00	$ 174,000.00
4	Perimeter Support of Excavation (SOE)	Allowance			$ 850,000.00
5	Off-Site Transport and Disposal of Non-hazardous Contaminated Fill Material and Soil	8,700	Ton	$ 60.00	$ 522,000.00
6	Dust, Odor, and Vapor Control	5	Months	$ 2,000.00	$ 10,000.00
7	Underground Storage Tank Removal	1	Each	$ 25,000.00	$ 25,000.00
8	Import of approved material for remedial excavation backfill and to raise Site grades	700	CY	$ 25.00	$ 17,500.00
				CONTRACTOR FEE ESTIMATED SUBTOTAL:	*$ 1,708,500.00*
				(15% CONTINGENCY OF CONTRACTOR FEE ESTIMATED SUBTOTAL):	*$ 256,275.00*
ENGINEERING FEES					
1	Construction Administration	12	Months	$ 10,000.00	$ 120,000.00
2	SOE Design	Allowance			$ 45,000.00
3	Construction Environmental Monitoring (includes community air monitoring program [CAMP] equipment rental)	5	Months	$ 30,000.00	$ 150,000.00
4	Special Inspection - Includes engineering special inspections for SOE installation	5	Months	$ 35,000.00	$ 175,000.00
5	Post-Excavation Confirmation Endpoint Sampling	53	Samples	$ 1,810.00	$ 95,930.00
6	Legal Fees	Allowance			$ 50,000.00
7	Remedial Investigation, Remedial Investigation Report, Remedial Action Work Plan (including CHASP)	Allowance			$ 135,000.00
8	Regulatory Agency Required Reporting (monthly, progress reports, Final Engineering Report [FER], Data Validation & EQuIS Submittals, CPP and fact sheets)	Allowance			$ 85,000.00
				ENGINEERING FEE ESTIMATED SUBTOTAL:	*$ 855,930.00*
				(15% CONTINGENCY OF ENGINEERING FEE ESTIMATED SUBTOTAL):	*$ 128,389.50*
				ESTIMATED REMEDIATION COST - ALTERNATIVE I:	**$ 2,950,000.00**

General Assumptions and Conditions:

1. The density used for conversion from cubic yards to tons was 1.5 tons per cubic yard.
2. Excavation depths were estimated using Remedial Investigation soil sample results.
3. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual fee. Utilization of this fee estimate information beyond the stated purpose is not recommended. Langan is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.
4. A 5 month period is assumed for remediation and soil handling.
5. RI = Remedial Investigation

Contractor Cost Assumptions:

-RAWP Item No. 4 - The new building excavation is anticipated to be located above the measured groundwater level at the site. The perimeter SOE is expected to include the installation of drilled soldier piles with lagging and interior rakers and heel blocks. For areas where the excavation will extend below adjacent building foundations, concrete underpinning piers will be installed.

-RAWP Item No. 5 - The unit rate provided reflects average disposal facility fees and may vary depending on time of year and facility.

-RAWP Item No. 6 - Cost estimate includes application of vapor/odor suppressing foam (as needed) to open excavations and soil loaded into trucks. Labor provided by excavation, handling, and disposal contractor provided above; this line item estimate reflects material, freight, and equipment fees.

-Costs provided above exclude limited profit, insurance, bonding, and general conditions.

Engineering Fee Assumptions:

-Engineering Item No. 4 - Special inspections as required by the New York City Department of Building.

-Engineering Item No. 5 - The cost assumes collection of 31 samples plus quality assurance/quality control samples. Sample analysis will be for Part 375 VOCs, SVOCs, PCBs, pesticides, cyanide, metals including hexavalent and trivalent chromium, and per- and PFAS and 1,4-dioxane. Fee includes subcontracted laboratory analysis by a NYSDOH ELAP-certified laboratory and ASP Category B deliverables.

Table 6
Remedial Action Work Plan
Track 2/4 Remedial Cost Estimate

130 Saint Felix Street
Brooklyn, New York
Regulatory Site No.: C224306
Langan Project No.: 100842301

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SITE PREPARATION COST
CONTRACTOR FEES					
1	Demolition of asphalt	Allowance			$ 10,000.00
2	Remediation Facilities, Mobilization, Demobilization, and Site Maintenance - Remediation and decontamination facilities, site fencing, trailer, truck cleaning facilities, etc.	Allowance			$ 100,000.00
3	Management and Handling of Contaminated Material (Remedial Excavation)	3,400	CY	$ 30.00	$ 102,000.00
4	Perimeter Support of Excavation (SOE)	Allowance			$ 800,000.00
5	Off-Site Transport and Disposal of Non-hazardous Contaminated Fill Material and Soil	5,100	Ton	$ 60.00	$ 306,000.00
6	Dust, Odor, and Vapor Control	4	Months	$ 2,000.00	$ 8,000.00
7	Underground Storage Tank Removal	1	Each	$ 25,000.00	$ 25,000.00
				CONTRACTOR FEE ESTIMATED SUBTOTAL:	*$ 1,351,000.00*
				(15% CONTINGENCY OF CONTRACTOR FEE ESTIMATED SUBTOTAL):	*$ 202,650.00*
ENGINEERING FEES					
1	Construction Administration	9	Months	$ 10,000.00	$ 90,000.00
2	SOE Design	Allowance			$ 45,000.00
3	Construction Environmental Monitoring (includes community air monitoring program [CAMP] equipment rental)	4	Months	$ 30,000.00	$ 120,000.00
4	Special Inspection - Includes engineering special inspections for SOE installation	4	Months	$ 35,000.00	$ 140,000.00
5	Post-Excavation Confirmation Endpoint Sampling	25	Samples	$ 1,810.00	$ 45,250.00
6	Legal Fees	Allowance			$ 50,000.00
7	Remedial Investigation, Remedial Investigation Report, Remedial Action Work Plan (including CHASP)	Allowance			$ 135,000.00
8	Regulatory Agency Required Reporting (monthly, progress reports, Final Engineering Report [FER], Data Validation & EQuIS Submittals, CPP and fact sheets)	Allowance			$ 85,000.00
9	Institutional Control Certification - Accounts for fees associated with preparation and submission of annual Periodic Review Reports for ten years.	10	years	6,000	$ 60,000.00
				ENGINEERING FEE ESTIMATED SUBTOTAL:	*$ 770,250.00*
				(15% CONTINGENCY OF ENGINEERING FEE ESTIMATED SUBTOTAL):	*$ 115,537.50*
				ESTIMATED REMEDIATION COST - ALTERNATIVE II:	**$ 2,440,000.00**

General Assumptions and Conditions:

1. The density used for conversion from cubic yards to tons was 1.5 tons per cubic yard.
2. Excavation depths were estimated using Remedial Investigation soil sample results.
3. This estimate has been prepared for the purposes of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual fee. Utilization of this fee estimate information beyond the stated purpose is not recommended. Langan is not licensed to provide financial or legal consulting services; as such, this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.
4. A 9 month period is assumed for remediation and soil handling.
5. RI = Remedial Investigation

Contractor Cost Assumptions:

-RAWP Item No. 4 - The new building excavation is anticipated to be located above the measured groundwater level at the site. The perimeter SOE is expected to include the installation of drilled soldier piles with lagging and interior rakers and heel blocks. For areas where the excavation will extend below adjacent building foundations, concrete underpinning piers will be installed.

-RAWP Item No. 5 - The unit rate provided reflects average disposal facility fees and may vary depending on time of year and facility.

-RAWP Item No. 6 - Cost estimate includes application of vapor/odor suppressing foam (as needed) to open excavations and soil loaded into trucks. Labor provided by excavation, handling, and disposal contractor provided above; this line item estimate reflects material, freight, and equipment fees.

-Costs provided above exclude limited profit, insurance, bonding, and general conditions.

Engineering Fee Assumptions:

-Engineering Item No. 4 - Special inspections as required by the New York City Department of Building.

-Engineering Item No. 5 - The cost assumes collection of 19 samples plus quality assurance/quality control samples. Sample analysis will be for Part 375 VOCs, SVOCs, PCBs, pesticides, cyanide, metals including hexavalent and trivalent chromium, and per- and PFAS and 1,4-dioxane. Fee includes subcontracted laboratory analysis by a NYSDOH ELAP-certified laboratory and ASP Category B deliverables.

-Engineering Item No. 9 - This task will be completed annually until such a time that the Environmental Easement is extinguished.

Table 7
Remedial Action Work Plan
Soil/Fill Import Criteria

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	NYSDEC Part 375 Protection of Groundwater SCOs
Volatile Organic Compounds (mg/kg)			
1,1,1-Trichloroethane	71-55-6	100	0.68
1,1-Dichloroethane	75-34-3	26	0.27
1,1-Dichloroethene	75-35-4	100	0.33
1,2,4-Trimethylbenzene	95-63-6	52	3.6
1,2-Dichlorobenzene	95-50-1	100	1.1
1,2-Dichloroethane	107-06-2	3.1	0.02
1,3,5-Trimethylbenzene (Mesitylene)	108-67-8	52	8.4
1,3-Dichlorobenzene	541-73-1	49	2.4
1,4-Dichlorobenzene	106-46-7	13	1.8
1,4-Dioxane (P-Dioxane)	123-91-1	13	0.1
Acetone	67-64-1	100	0.05
Benzene	71-43-2	4.8	0.06
Carbon Tetrachloride	56-23-5	2.4	0.76
Chlorobenzene	108-90-7	100	1.1
Chloroform	67-66-3	49	0.37
Cis-1,2-Dichloroethene	156-59-2	100	0.25
Ethylbenzene	100-41-4	41	1
Hexachlorobenzene	118-74-1	1.2	3.2
Methyl Ethyl Ketone (2-Butanone)	78-93-3	100	0.12
Methylene Chloride	75-09-2	100	0.05
Naphthalene	91-20-3	100	12
n-Butylbenzene	104-51-8	100	12
n-Propylbenzene	103-65-1	100	3.9
Sec-Butylbenzene	135-98-8	100	11
T-Butylbenzene	98-06-6	100	5.9
Tert-Butyl Methyl Ether	1634-04-4	100	0.93
Tetrachloroethene (PCE)	127-18-4	19	1.3
Toluene	108-88-3	100	0.7
Total Xylenes	1330-20-7	100	1.6
Trans-1,2-Dichloroethene	156-60-5	100	0.19
Trichloroethene (TCE)	79-01-6	21	0.47
Vinyl Chloride	75-01-4	0.9	0.02
Semivolatile Organic Compounds (mg/kg)			
1,2-Dichlorobenzene	95-50-1	100	1.1
1,3-Dichlorobenzene	541-73-1	49	2.4
1,4-Dichlorobenzene	106-46-7	13	1.8
1,4-Dioxane (P-Dioxane)	123-91-1	13	0.1
2-Methylphenol (o-Cresol)	95-48-7	100	0.33
3 & 4 Methylphenol (m&p Cresol)	65794-96-9	100	0.33
Acenaphthene	83-32-9	100	98
Acenaphthylene	208-96-8	100	107
Anthracene	120-12-7	100	1,000
Benzo(a)anthracene	56-55-3	1	1
Benzo(a)pyrene	50-32-8	1	22
Benzo(b)fluoranthene	205-99-2	1	1.7
Benzo(g,h,i)Perylene	191-24-2	100	1,000
Benzo(k)fluoranthene	207-08-9	3.9	1.7
Chrysene	218-01-9	3.9	1
Dibenz(a,h)anthracene	53-70-3	0.33	1,000
Dibenzofuran	132-64-9	59	210
Fluoranthene	206-44-0	100	1,000
Fluorene	86-73-7	100	386
Hexachlorobenzene	118-74-1	1.2	3.2
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	8.2
Naphthalene	91-20-3	100	12
Pentachlorophenol	87-86-5	6.7	0.8
Phenanthrene	85-01-8	100	1,000
Phenol	108-95-2	100	0.33
Pyrene	129-00-0	100	1,000

Notes provided on Page 2.

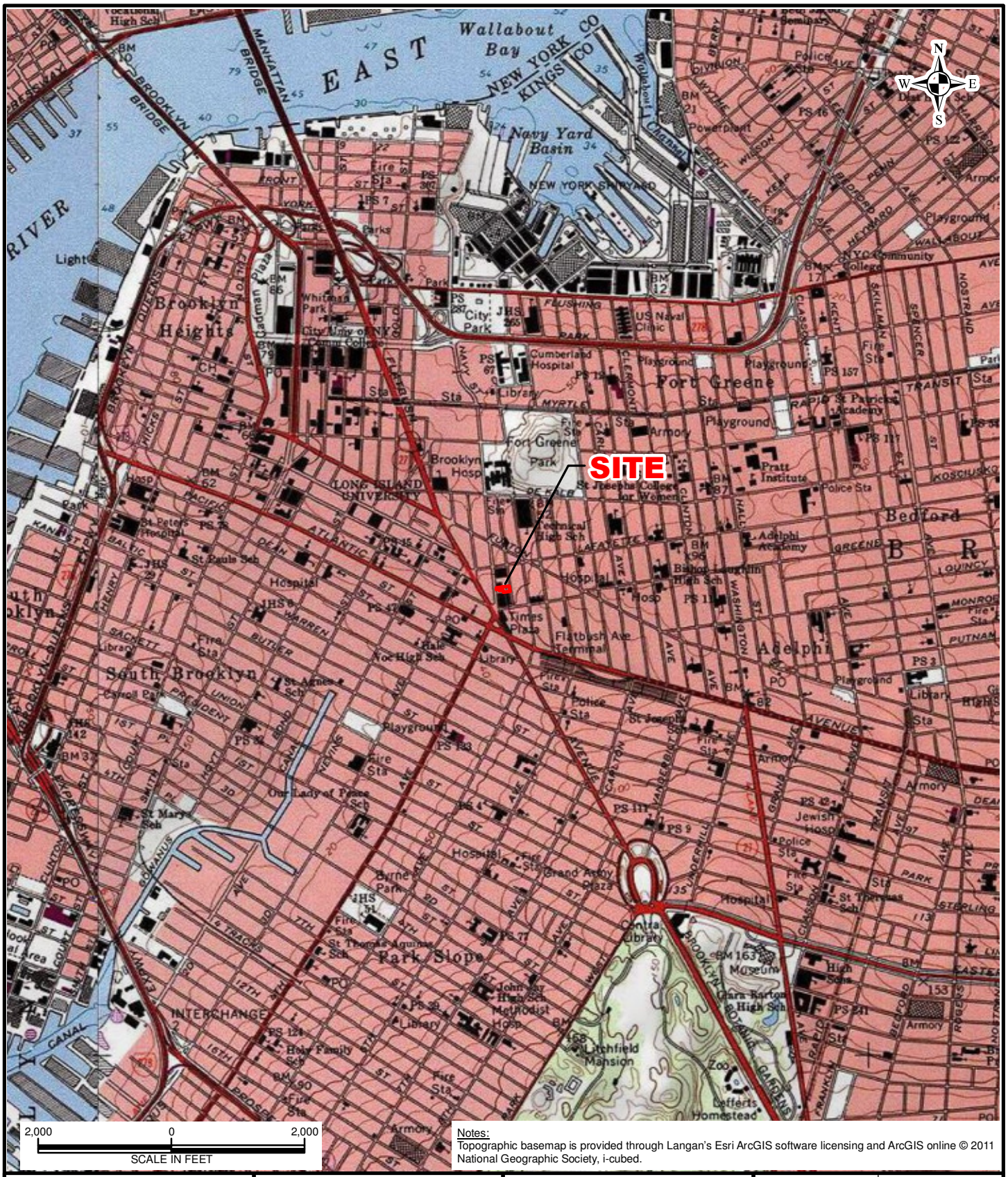
Table 7
Remedial Action Work Plan
Soil/Fill Import Criteria

130 Saint Felix Street Site
Brooklyn, New York
NYSDEC BCP Site No.: C224306
Langan Project No.: 100842301

Analyte	CAS Number	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs	NYSDEC Part 375 Protection of Groundwater SCOs
Pesticides (mg/kg)			
4,4'-DDD	72-54-8	13	14
4,4'-DDE	72-55-9	8.9	17
4,4'-DDT	50-29-3	7.9	136
Aldrin	309-00-2	0.097	0.19
Alpha BHC (Alpha Hexachlorocyclohexa	319-84-6	0.48	0.02
Alpha Chlordane	5103-71-9	4.2	2.9
Alpha Endosulfan	959-98-8	24	102
Beta Bhc (Beta Hexachlorocyclohexane	319-85-7	0.36	0.09
Beta Endosulfan	33213-65-9	24	102
Delta Bhc (Delta Hexachlorocyclohexan	319-86-8	100	0.25
Dibenzofuran	132-64-9	59	210
Dieldrin	60-57-1	0.2	0.1
Endosulfan Sulfate	1031-07-8	24	1,000
Endrin	72-20-8	11	0.06
Gamma Bhc (Lindane)	58-89-9	1.3	0.1
Heptachlor	76-44-8	2.1	0.38
Herbicides (mg/kg)			
Silvex (2,4,5-Tp)	93-72-1	100	3.8
Polychlorinated Biphenyls (mg/kg)			
Total PCBs	1336-36-3	1	3.2
Inorganics (mg/kg)			
Arsenic	7440-38-2	16	16
Barium	7440-39-3	400	820
Beryllium	7440-41-7	72	47
Cadmium	7440-43-9	4.3	7.5
Chromium, Hexavalent	18540-29-9	110	19
Chromium, Trivalent	16065-83-1	180	~
Copper	7440-50-8	270	1,720
Total Cyanide	~	27	40
Lead	7439-92-1	400	450
Manganese	7439-96-5	2,000	2,000
Mercury	7439-97-6	0.81	0.73
Nickel	7440-02-0	310	130
Selenium	7782-49-2	180	4
Silver	7440-22-4	180	8.3
Zinc	7440-66-6	10,000	2,480

Notes:
1. Soil cleanup objectives taken from New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part
2. Criterion comparisons for 3- & 4-methylphenol (m&p cresol) are provided for reference. Promulgated SCOs are for 3-methylphenol (m-
3. ~ = Regulatory limit for this analyte does not exist
4. mg/kg = milligrams per kilogram

FIGURES



Notes:
Topographic basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online © 2011 National Geographic Society, i-cubed.

LANGAN

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Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
130 SAINT FELIX STREET
BLOCK No. 2111,
Portion of LOT No. 40
BROOKLYN NEW YORK

Drawing Title
SITE LOCATION MAP

Project No. 100842301	Figure 1
Date 7/31/2024	
Scale 1"=2,000'	
Drawn By IHB	

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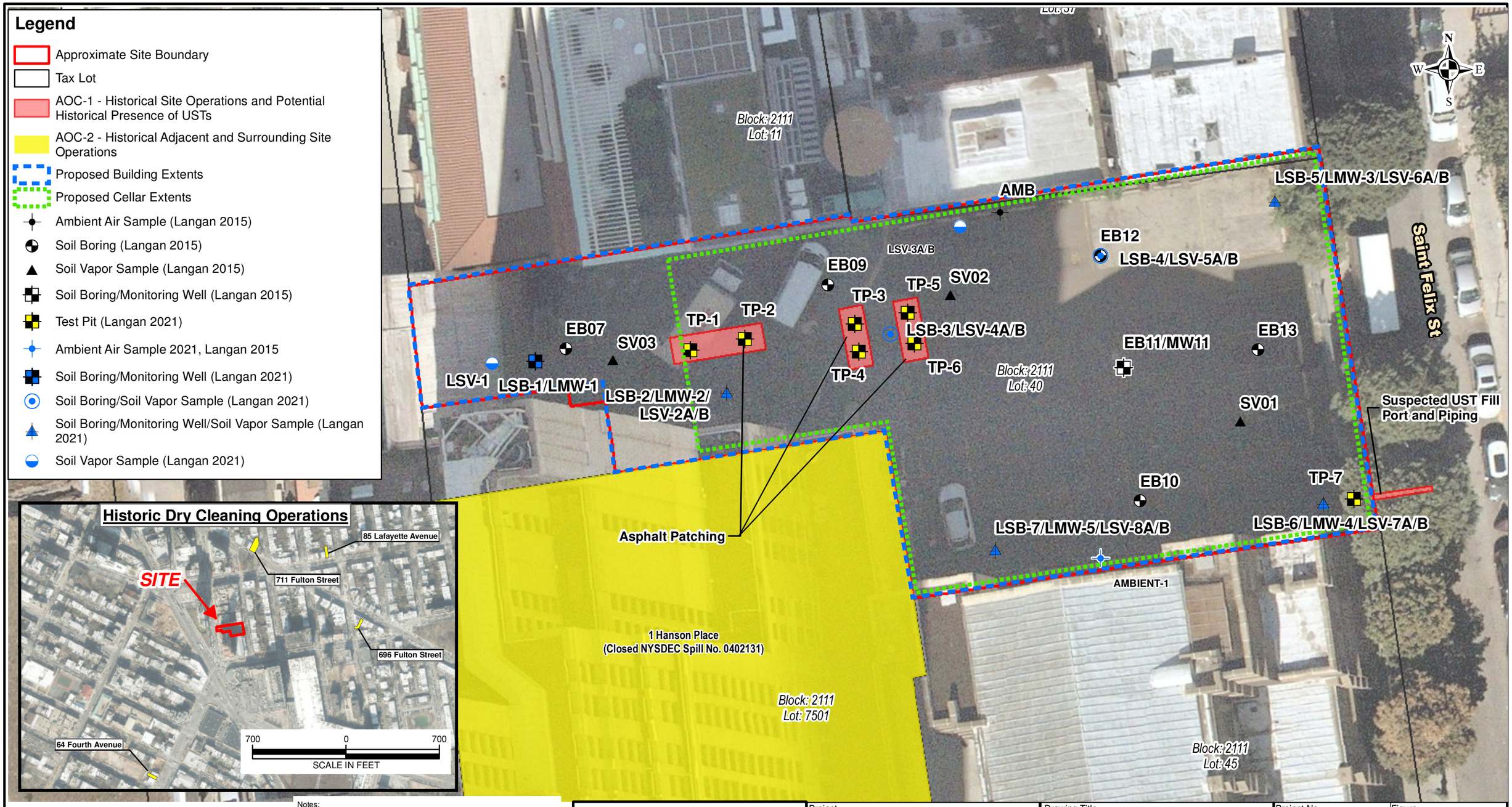
Path: \\langan.com\data\PAR\data3\100842301\Project Data\ArcGIS\MXD\Environmental_Figures\2022-06 RAWP\10.5\Figure 1 - Site Location Map.mxd Date: 7/31/2024 User: ibaker Time: 11:50:58 AM



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SCALE IN FEET

Notes:
1. Aerial imagery provided through Langan's subscription to Esri's ArcGIS software licensing.
2. Parcel information from MapPLUTO 18v2 copyrighted by the New York City Department of Planning.
3. Historic sample locations from June 2015 Subsurface Investigation Report, prepared by Langan.
4. All sample locations are approximate and based on field measurements.
5. UST fill port and piping were detected during NOVA's 2020 Geophysical Survey. Approximate locations of asphalt patches are based on field observations made by Langan in 2020.
6. LSV-1 and LSV-2A through LSV-8A were installed to 5 ft bgs and LSV-2B through LSV-8B were installed to 20.5 bgs.
7. Site boundary extents are based on Metes and Bounds Description provided by True North Surveyors, P.C.

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Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
130 SAINT FELIX STREET
BLOCK No. 2111, Portion of LOT No. 40
BROOKLYN NEW YORK

Drawing Title
SITE PLAN

Project No.	100842301
Date	7/31/2024
Scale	1 " = 20 '
Drawn By	IHB
Figure	2

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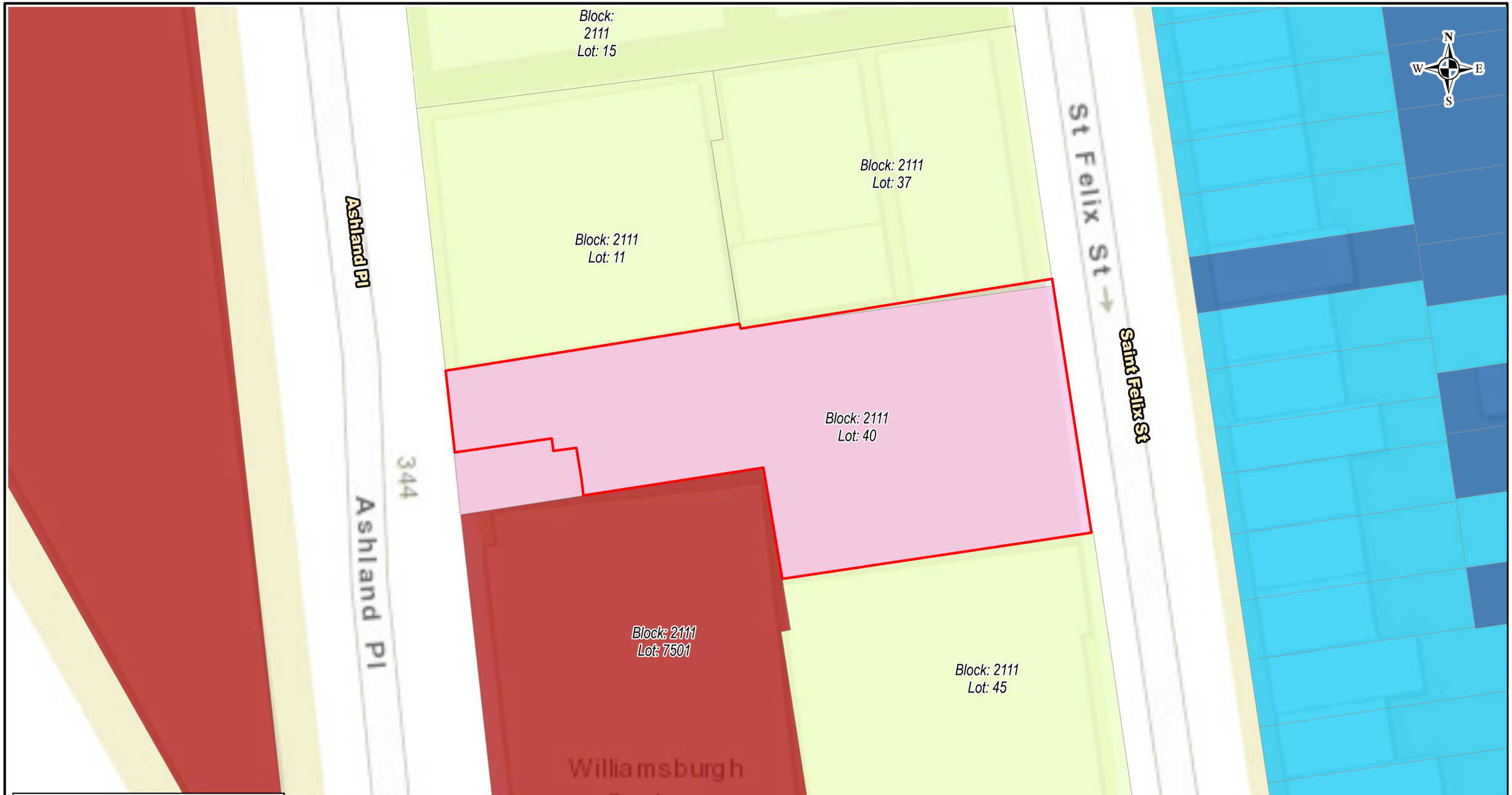
Path: \\langan.com\data\PAR\data3\100842301\Project Data\ArcGIS\MXD\Environmental_Figures\2022-06 RAWP\10.5\Figure 2 - Site Plan.mxd Date: 7/31/2024 User: ibaker Time: 11:50:21 AM



Legend

- Approximate Site Boundary

LandUse

- 1 & 2 Family Residential
- Multi-Family Residential
- Mixed Use
- Public Facilities & Outdoor Recreation
- Parking Facilities

30 0 30
SCALE IN FEET

Notes:
1.World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.
2. Parcel information from MapPLUTO 20v5 copyrighted by the New York City Department of Planning.

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Project
130 SAINT FELIX STREET
BLOCK No. 2111, LOT No. 40
BROOKLYN NEW YORK

Drawing Title
ADJACENT PROPERTIES AND SURROUNDING SITES

Project No.	100842301
Date	7/31/2024
Scale	1:360
Drawn By	JF
Figure	3

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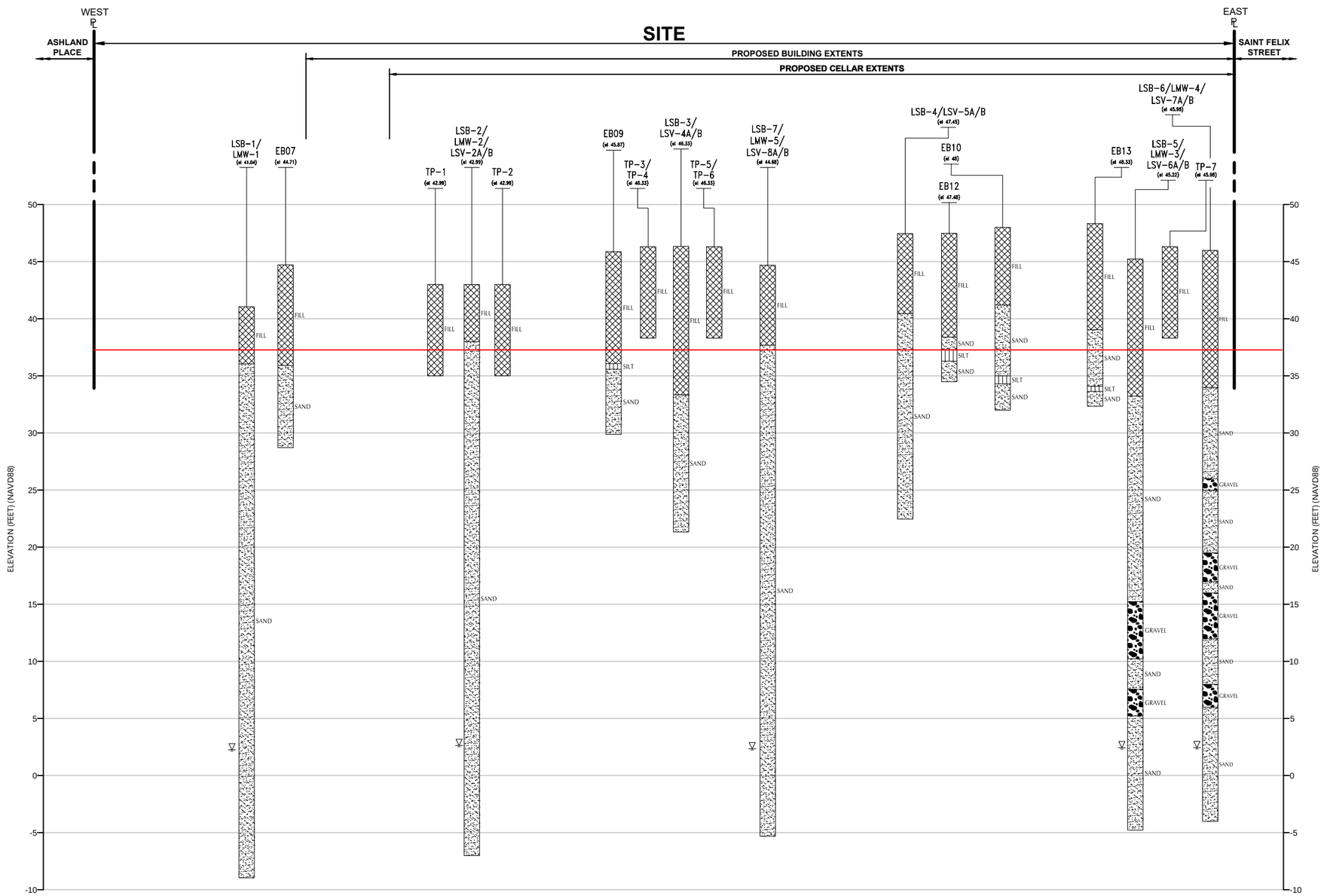

SUBSURFACE PROFILE A-A'

VERTICAL SCALE: 1" = 10'
HORIZONTAL SCALE: 1" = 20'

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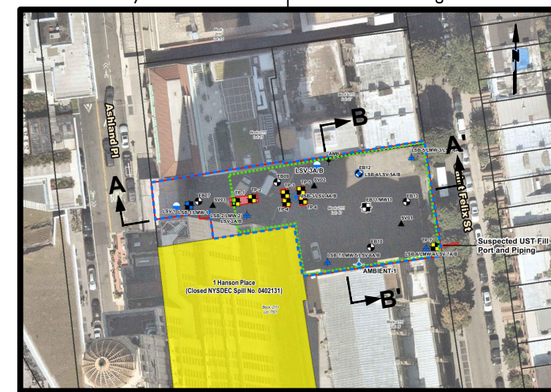
VERTICAL SCALE: 1" = 10'

20 0 10 20
HORIZONTAL SCALE: 1" = 20'



KEY PLAN

N.T.S.

BORING KEY:

B-X
(el XX±)

MATERIAL
(AS SPECIFIED)

LEGEND:

B-X	DRILLED BORING IDENTIFICATION
el XX±	APPROXIMATE SURFACE ELEVATION AT THE TIME OF BORING (NAVD88)
▽	GROUNDWATER IN MONITORING WELL
——	AVERAGE ELEVATION OF FILL/NATIVE INTERFACE

NOTES:

1. THIS PROFILE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED, SEE BORING LOGS INCLUDED IN APPENDIX B AND APPENDIX H.
2. SOIL BORING LOCATIONS ARE APPROXIMATE. GROUND SURFACE ELEVATIONS OF SOIL BORINGS COLLOCATED WITH MONITORING WELLS (LSB-1, LSB-2, AND LSB-5 THROUGH LSB-7) WERE SURVEYED USING GPS LOCATING TECHNIQUES. GROUND SURFACE ELEVATIONS OF EB07 THROUGH EB12, LSB-3, AND LSB-4 WERE INFERRED USING LIDAR FILES.
3. SOIL BORINGS EB07 THROUGH EB13 WERE COMPLETED DURING THE 2015 SUBSURFACE INVESTIGATION AND SOIL BORINGS LSB-1 THROUGH LSB-7 WERE COMPLETED DURING THE 2021 REMEDIAL INVESTIGATION.
4. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, NAVD88.

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, LAND SURVEYOR OR GEOLOGIST, TO ALTER THIS ITEM IN ANY WAY.

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Project	Drawing Title	Project No.	Drawing No.
130 SAINT FELIX STREET BLOCK No. 2111, LOT No. 40 BROOKLYN KINGS COUNTY NEW YORK	SUBSURFACE PROFILE A–A'	100842301	4A
		Date 07/01/2021	
		Drawn By AC	
		Checked By BR	

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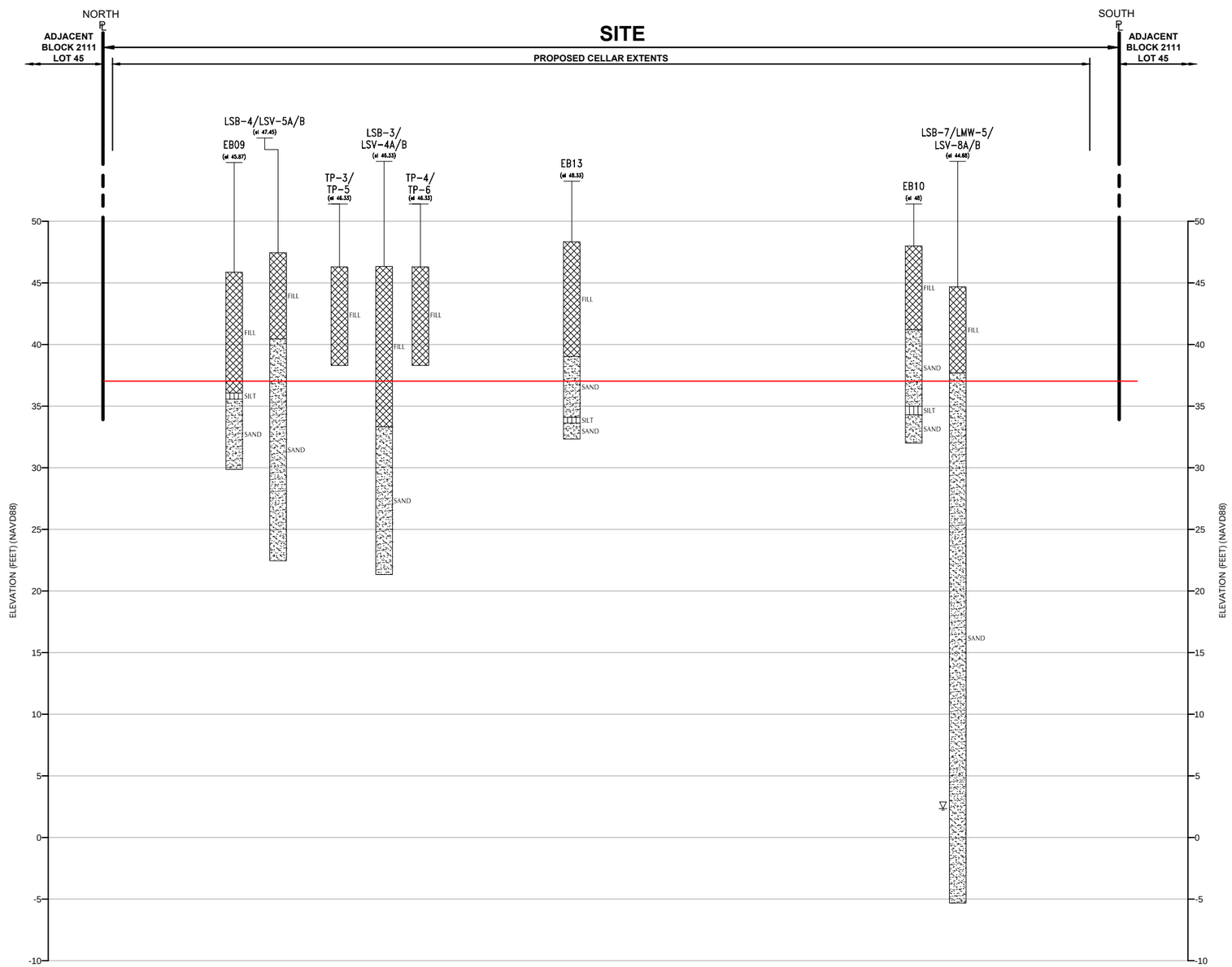

SUBSURFACE PROFILE B-B'

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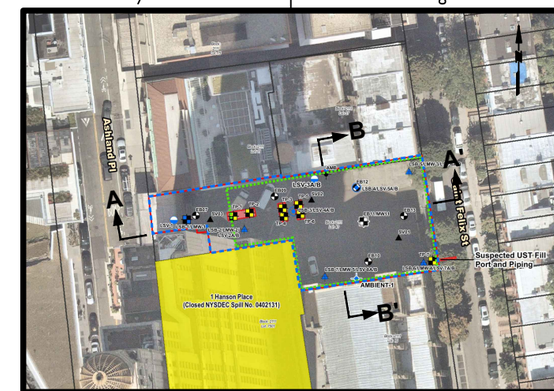
HORIZONTAL SCALE: 1" = 20'



KEY PLAN

N.T.S.

BORING KEY:

B-X
(el XX±)

MATERIAL
(AS SPECIFIED)

LEGEND:

B-X	DRILLED BORING IDENTIFICATION
el XX±	APPROXIMATE SURFACE ELEVATION AT THE TIME OF BORING (NAVD88)
▽	GROUNDWATER IN MONITORING WELL
——	AVERAGE ELEVATION OF FILL/NATIVE INTERFACE

NOTES:

1. THIS PROFILE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED, SEE BORING LOGS INCLUDED IN APPENDIX B AND APPENDIX H.
2. SOIL BORING LOCATIONS ARE APPROXIMATE. GROUND SURFACE ELEVATIONS OF SOIL BORINGS COLLOCATED WITH MONITORING WELLS (LSB-1, LSB-2, AND LSB-5 THROUGH LSB-7) WERE SURVEYED USING GPS LOCATING TECHNIQUES. GROUND SURFACE ELEVATIONS OF EB07 THROUGH EB12, LSB-3, AND LSB-4 WERE INFERRED USING LIDAR FILES.
3. SOIL BORINGS EB07 THROUGH EB13 WERE COMPLETED DURING THE 2015 SUBSURFACE INVESTIGATION AND SOIL BORINGS LSB-1 THROUGH LSB-7 WERE COMPLETED DURING THE 2021 REMEDIAL INVESTIGATION.
4. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, NAVD88.

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, LAND SURVEYOR OR GEOLOGIST, TO ALTER THIS ITEM IN ANY WAY.

10 0 5 10
VERTICAL SCALE: 1" = 10'

20 0 10 20
HORIZONTAL SCALE: 1" = 20'

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Project	Drawing Title	Project No.	Drawing No.
130 SAINT FELIX STREET BLOCK No. 2111, LOT No. 40 BROOKLYN KINGS COUNTY NEW YORK	SUBSURFACE PROFILE B–B'	100842301 Date 07/01/2021 Drawn By AC Checked By BR	4B

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Filename: \\langan.com\data\PAR\data3\100842301\Project Data\CAD\01\SheetFiles\Environmental\100842301-NF201-0101.dwg Date: 5/16/2024 Time: 10:41 User: ibaker Style Table: Langan.stb Layout: B-B' _11 X 17

Legend

- Approximate Site Boundary
- Tax Lot
- AOC-1 - Historical Site Operations and Potential Historical Presence of USTs
- AOC-2 - Historical Adjacent and Surrounding Site Operations
- Proposed Building Extents
- Proposed Cellar Extents
- Ambient Air Sample (Langan 2015)
- Soil Boring (Langan 2015)
- Soil Vapor Sample (Langan 2015)
- Soil Boring/Monitoring Well (Langan 2015)
- Test Pit (Langan 2021)
- Ambient Air Sample 2021, Langan 2015
- Soil Boring/Monitoring Well (Langan 2021)
- Soil Boring/Soil Vapor Sample (Langan 2021)
- Soil Boring/Monitoring Well/Soil Vapor Sample (Langan 2021)
- Soil Vapor Sample (Langan 2021)

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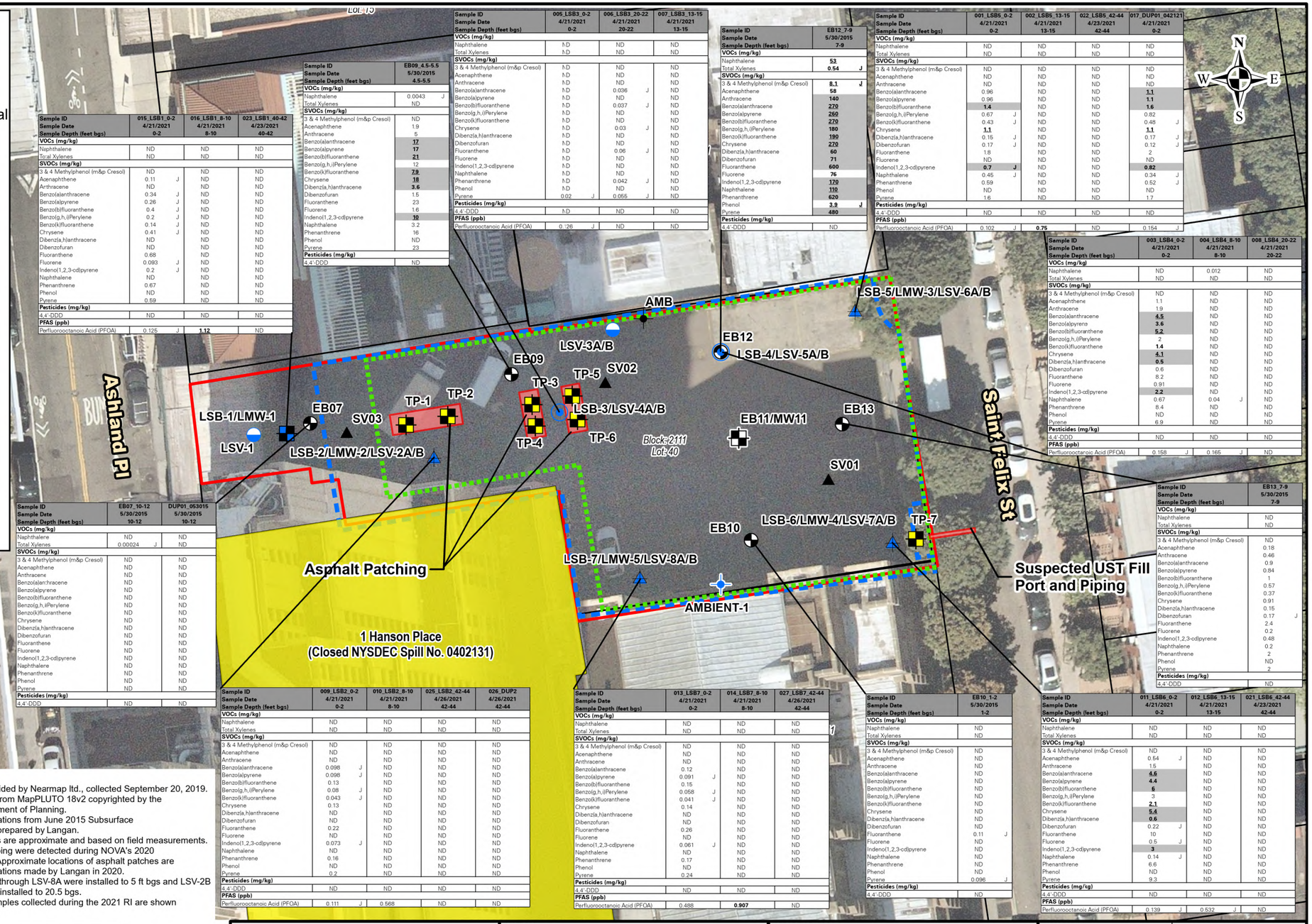
SCALE IN FEET



Sample ID	015_LSB1_0-2	016_LSB1_8-10	023_LSB1_40-42
Sample Date	4/21/2021	4/21/2021	4/23/2021
Sample Depth (feet bgs)	0-2	8-10	40-42
VOCs (mg/kg)			
Naphthalene	ND	ND	ND
Total Xylenes	ND	ND	ND
SVOCs (mg/kg)			
3 & 4 Methylphenol (m&p Cresol)	ND	ND	ND
Acenaphthene	0.11 J	ND	ND
Anthracene	ND	ND	ND
Benzo(a)anthracene	0.34 J	ND	ND
Benzo(a)pyrene	0.26 J	ND	ND
Benzo(b)fluoranthene	0.4 J	ND	ND
Benzo(g,h,i)Perylene	0.2 J	ND	ND
Benzo(k)fluoranthene	0.14 J	ND	ND
Chrysene	0.41 J	ND	ND
Dibenz(a,h)anthracene	ND	ND	ND
Dibenzofuran	ND	ND	ND
Fluoranthene	0.68	ND	ND
Fluorene	0.093 J	ND	ND
Indeno(1,2,3-cd)pyrene	0.2 J	ND	ND
Naphthalene	ND	ND	ND
Phenanthrene	0.67	ND	ND
Phenol	ND	ND	ND
Pyrene	0.59	ND	ND
Pesticides (mg/kg)			
4,4'-DDD	ND	ND	ND
PFAS (ppb)			
Perfluorooctanoic Acid (PFOA)	0.125 J	1.12	ND

Sample ID	EB09_4.5-5.5
Sample Date	5/30/2015
Sample Depth (feet bgs)	4.5-5.5
VOCs (mg/kg)	
Naphthalene	0.0043 J
Total Xylenes	ND
SVOCs (mg/kg)	
3 & 4 Methylphenol (m&p Cresol)	ND
Acenaphthene	1.9
Anthracene	5
Benzo(a)anthracene	17
Benzo(a)pyrene	17
Benzo(b)fluoranthene	21
Benzo(g,h,i)Perylene	12
Benzo(k)fluoranthene	7.9
Chrysene	18
Dibenz(a,h)anthracene	3.6
Dibenzofuran	1.5
Fluoranthene	23
Fluorene	1.6
Indeno(1,2,3-cd)pyrene	10
Naphthalene	3.2
Phenanthrene	16
Phenol	ND
Pyrene	23
Pesticides (mg/kg)	
4,4'-DDD	ND

Sample ID	005_LSB3_0-2	006_LSB3_20-22	007_LSB3_13-15
Sample Date	4/21/2021	4/21/2021	4/21/2021
Sample Depth (feet bgs)	0-2	20-22	13-15
VOCs (mg/kg)			
Naphthalene	ND	ND	ND
Total Xylenes	ND	ND	ND
SVOCs (mg/kg)			
3 & 4 Methylphenol (m&p Cresol)	ND	ND	ND
Acenaphthene	ND	ND	ND
Anthracene	ND	ND	ND
Benzo(a)anthracene	ND	0.038 J	ND
Benzo(a)pyrene	ND	ND	ND
Benzo(b)fluoranthene	ND	0.037 J	ND
Benzo(g,h,i)Perylene	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND
Chrysene	ND	0.03 J	ND
Dibenz(a,h)anthracene	ND	ND	ND
Dibenzofuran	ND	ND	ND
Fluoranthene	ND	0.06 J	ND
Fluorene	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND
Naphthalene	ND	ND	ND
Phenanthrene	ND	0.042 J	ND
Phenol	ND	ND	ND
Pyrene	0.02 J	0.055 J	ND
Pesticides (mg/kg)			
4,4'-DDD	ND	ND	ND
PFAS (ppb)			
Perfluorooctanoic Acid (PFOA)	0.126 J	ND	ND

Sample ID	EB12_7-9
Sample Date	5/30/2015
Sample Depth (feet bgs)	7-9
VOCs (mg/kg)	
Naphthalene	53
Total Xylenes	0.54 J
SVOCs (mg/kg)	
3 & 4 Methylphenol (m&p Cresol)	8.1 J
Acenaphthene	58
Anthracene	140
Benzo(a)anthracene	270
Benzo(a)pyrene	260
Benzo(b)fluoranthene	270
Benzo(g,h,i)Perylene	180
Benzo(k)fluoranthene	190
Chrysene	270
Dibenz(a,h)anthracene	60
Dibenzofuran	71
Fluoranthene	600
Fluorene	76
Indeno(1,2,3-cd)pyrene	170
Naphthalene	110
Phenanthrene	620
Phenol	3.9 J
Pyrene	480
Pesticides (mg/kg)	
4,4'-DDD	ND

Sample ID	001_LSB5_0-2	002_LSB5_13-15	022_LSB5_42-44	017_DUP01_042121
Sample Date	4/21/2021	4/21/2021	4/23/2021	4/21/2021
Sample Depth (feet bgs)	0-2	13-15	42-44	0-2
VOCs (mg/kg)				
Naphthalene	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND
SVOCs (mg/kg)				
3 & 4 Methylphenol (m&p Cresol)	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND
Benzo(a)anthracene	0.96	ND	ND	1.1
Benzo(a)pyrene	0.96	ND	ND	1.1
Benzo(b)fluoranthene	1.4	ND	ND	1.6
Benzo(g,h,i)Perylene	0.67 J	ND	ND	0.82
Benzo(k)fluoranthene	0.43 J	ND	ND	0.48 J
Chrysene	1.1	ND	ND	1.1
Dibenz(a,h)anthracene	0.15 J	ND	ND	0.17 J
Dibenzofuran	0.17 J	ND	ND	0.12 J
Fluoranthene	1.8	ND	ND	2
Fluorene	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.7 J	ND	ND	0.82
Naphthalene	0.45 J	ND	ND	0.34 J
Phenanthrene	0.59	ND	ND	0.52 J
Phenol	ND	ND	ND	ND
Pyrene	1.6	ND	ND	1.7
Pesticides (mg/kg)				
4,4'-DDD	ND	ND	ND	ND
PFAS (ppb)				
Perfluorooctanoic Acid (PFOA)	0.102 J	0.75	ND	0.154 J

Sample ID	003_LSB4_0-2	004_LSB4_8-10	008_LSB4_20-22
Sample Date	4/21/2021	4/21/2021	4/21/2021
Sample Depth (feet bgs)	0-2	8-10	20-22
VOCs (mg/kg)			
Naphthalene	ND	0.012	ND
Total Xylenes	ND	ND	ND
SVOCs (mg/kg)			
3 & 4 Methylphenol (m&p Cresol)	ND	ND	ND
Acenaphthene	1.1	ND	ND
Anthracene	1.9	ND	ND
Benzo(a)anthracene	4.5	ND	ND
Benzo(a)pyrene	3.6	ND	ND
Benzo(b)fluoranthene	5.2	ND	ND
Benzo(g,h,i)Perylene	2	ND	ND
Benzo(k)fluoranthene	1.4	ND	ND
Chrysene	4.1	ND	ND
Dibenz(a,h)anthracene	0.5	ND	ND
Dibenzofuran	0.6	ND	ND
Fluoranthene	8.2	ND	ND
Fluorene	0.91	ND	ND
Indeno(1,2,3-cd)pyrene	2.2	ND	ND
Naphthalene	0.67	0.04 J	ND
Phenanthrene	8.4	ND	ND
Phenol	ND	ND	ND
Pyrene	6.9	ND	ND
Pesticides (mg/kg)			
4,4'-DDD	ND	ND	ND
PFAS (ppb)			
Perfluorooctanoic Acid (PFOA)	0.158 J	0.165 J	ND

Sample ID	EB13_7-9
Sample Date	5/30/2015
Sample Depth (feet bgs)	7-9
VOCs (mg/kg)	
Naphthalene	ND
Total Xylenes	ND
SVOCs (mg/kg)	
3 & 4 Methylphenol (m&p Cresol)	ND
Acenaphthene	0.18
Anthracene	0.46
Benzo(a)anthracene	0.9
Benzo(a)pyrene	0.84
Benzo(b)fluoranthene	1
Benzo(g,h,i)Perylene	0.57
Benzo(k)fluoranthene	0.37
Chrysene	0.91
Dibenz(a,h)anthracene	0.15
Dibenzofuran	0.17 J
Fluoranthene	2.4
Fluorene	0.2
Indeno(1,2,3-cd)pyrene	0.48
Naphthalene	0.2
Phenanthrene	2
Phenol	ND
Pyrene	2
Pesticides (mg/kg)	
4,4'-DDD	ND

Sample ID	EB07_10-12	DUP01_053015
Sample Date	5/30/2015	5/30/2015
Sample Depth (feet bgs)	10-12	10-12
VOCs (mg/kg)		
Naphthalene	ND	ND
Total Xylenes	0.00024 J	ND
SVOCs (mg/kg)		
3 & 4 Methylphenol (m&p Cresol)	ND	ND
Acenaphthene	ND	ND
Anthracene	ND	ND
Benzo(a)an:hracene	ND	ND
Benzo(a)pyrene	ND	ND
Benzo(b)fluoranthene	ND	ND
Benzo(g,h,i)Perylene	ND	ND
Benzo(k)fluoranthene	ND	ND
Chrysene	ND	ND
Dibenz(a,h)anthracene	ND	ND
Dibenzofuran	ND	ND
Fluoranthene	ND	ND
Fluorene	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND
Naphthalene	ND	ND
Phenanthrene	ND	ND
Phenol	ND	ND
Pyrene	ND	ND
Pesticides (mg/kg)		
4,4'-DDD	ND	ND

Sample ID	009_LSB2_0-2	010_LSB2_8-10	025_LSB2_42-44	026_DUP2
Sample Date	4/21/2021	4/21/2021	4/26/2021	4/26/2021
Sample Depth (feet bgs)	0-2	8-10	42-44	42-44
VOCs (mg/kg)				
Naphthalene	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND
SVOCs (mg/kg)				
3 & 4 Methylphenol (m&p Cresol)	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND
Benzo(a)anthracene	0.098 J	ND	ND	ND
Benzo(a)pyrene	0.098 J	ND	ND	ND
Benzo(b)fluoranthene	0.13	ND	ND	ND
Benzo(g,h,i)Perylene	0.08 J	ND	ND	ND
Benzo(k)fluoranthene	0.043 J	ND	ND	ND
Chrysene	0.13	ND	ND	ND
Dibenz(a,h)anthracene	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND
Fluoranthene	0.22	ND	ND	ND
Fluorene	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.073 J	ND	ND	ND
Naphthalene	ND	ND	ND	ND
Phenanthrene	0.16	ND	ND	ND
Phenol	ND	ND	ND	ND
Pyrene	0.2	ND	ND	ND
Pesticides (mg/kg)				
4,4'-DDD	ND	ND	ND	ND
PFAS (ppb)				
Perfluorooctanoic Acid (PFOA)	0.111 J	0.568	ND	ND

Sample ID	013_LSB7_0-2	014_LSB7_8-10	027_LSB7_42-44
Sample Date	4/21/2021	4/21/2021	4/26/2021
Sample Depth (feet bgs)	0-2	8-10	42-44
VOCs (mg/kg)			
Naphthalene	ND	ND	ND
Total Xylenes	ND	ND	ND
SVOCs (mg/kg)			
3 & 4 Methylphenol (m&p Cresol)	ND	ND	ND
Acenaphthene	ND	ND	ND
Anthracene	ND	ND	ND
Benzo(a)anthracene	0.12	ND	ND
Benzo(a)pyrene	0.091 J	ND	ND
Benzo(b)fluoranthene	0.15	ND	ND
Benzo(g,h,i)Perylene	0.058 J	ND	ND
Benzo(k)fluoranthene	0.041 J	ND	ND
Chrysene	0.14	ND	ND
Dibenz(a,h)anthracene	ND	ND	ND
Dibenzofuran	ND	ND	ND
Fluoranthene	0.26	ND	ND
Fluorene	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.061 J	ND	ND
Naphthalene	ND	ND	ND
Phenanthrene	0.17	ND	ND
Phenol	ND	ND	ND
Pyrene	0.24	ND	ND
Pesticides (mg/kg)			
4,4'-DDD	ND	ND	ND
PFAS (ppb)			
Perfluorooctanoic Acid (PFOA)	0.488	0.907	ND

Sample ID	EB10_1-2
Sample Date	5/30/2015
Sample Depth (feet bgs)	1-2
VOCs (mg/kg)	
Naphthalene	ND
Total Xylenes	ND
SVOCs (mg/kg)	
3 & 4 Methylphenol (m&p Cresol)	ND
Acenaphthene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(g,h,i)Perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Dibenzofuran	ND
Fluoranthene	0.11 J
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
Naphthalene	ND
Phenanthrene	ND
Phenol	ND
Pyrene	0.096 J
Pesticides (mg/kg)	
4,4'-DDD	ND

Sample ID	011_LSB6_0-2	012_LSB6_13-15	021_LSB6_42-44
Sample Date	4/21/2021	4/21/2021	4/23/2021
Sample Depth (feet bgs)	0-2	13-15	42-44
VOCs (mg/kg)			
Naphthalene	ND	ND	ND
Total Xylenes	ND	ND	ND
SVOCs (mg/kg)			
3 & 4 Methylphenol (m&p Cresol)	ND	ND	ND
Acenaphthene	0.54 J	ND	ND
Anthracene	1.5	ND	ND
Benzo(a)anthracene	4.6	ND	ND
Benzo(a)pyrene	4.4	ND	ND
Benzo(b)fluoranthene	6	ND	ND
Benzo(g,h,i)Perylene	3	ND	ND
Benzo(k)fluoranthene	2.1	ND	ND
Chrysene	5.4	ND	ND
Dibenz(a,h)anthracene	0.6	ND	ND
Dibenzofuran	0.22 J	ND	ND
Fluoranthene	10	ND	ND
Fluorene	0.5 J	ND	ND
Indeno(1,2,3-cd)pyrene	3	ND	ND
Naphthalene	0.14 J	ND	ND
Phenanthrene	6.6	ND	ND
Phenol	ND	ND	ND
Pyrene	9.3	ND	ND
Pesticides (mg/kg)			
4,4'-DDD	ND	ND	ND
PFAS (ppb)			
Perfluorooctanoic Acid (PFOA)	0.139 J	0.532 J	ND

Analyte	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
VOCs (mg/kg)			
Naphthalene	12	12	100
Total Xylenes	0.26	1.6	100
SVOCs (mg/kg)			
3 & 4 Methylphenol (m&p Cresol)	0.33	0.33	100
Acenaphthene	20	98	100
Anthracene	100	1,000	100
Benzo(a)anthracene	1	1	1
Benzo(a)pyrene	1	22	1
Benzo(b)fluoranthene	1	1.7	1
Benzo(g,h,i)Perylene	100	1,000	100
Benzo(k)fluoranthene	0.8	1.7	3.9
Chrysene	1	1	3.9
Dibenz(a,h)anthracene	0.33	1,000	0.33
Dibenzofuran	7	210	59
Fluoranthene	100	1,000	100
Fluorene	30	386	100
Indeno(1,2,3-cd)pyrene	0.5	8.2	0.5
Naphthalene	12	12	100
Phenanthrene	100	1,000	100
Phenol	0.33	0.33	100
Pyrene	100	1,000	100
Pesticides (mg/kg)			
4,4'-DDD	0.0033	14	13

Analyte	NYSDEC Part 375 Unrestricted Use Guidance Values	NYSDEC Part 375 Protection of Groundwater Guidance Values	NYSDEC Part 375 Restricted Use Restricted-Residential Guidance Values
PFAS (ppb)			
Perfluorooctanoic Acid (PFOA)	0.66	0.8	33

Notes:
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2. Parcel information from MapPLUTO 18v2 copyrighted by the New York City Department of Planning.
3. Historic sample locations from June 2015 Subsurface Investigation Report, prepared by Langan.
4. All sample locations are approximate and based on field measurements.
5. UST fill port and piping were detected during NOVA's 2020 Geophysical Survey. Approximate locations of asphalt patches are based on field observations made by Langan in 2020.
6. LSV-1 and LSV-2A through LSV-8A were installed to 5 ft bgs and LSV-2B through LSV-8B were installed to 20.5 bgs.
7. Chemboxes for samples collected during the 2021 RI are shown with a bold outline.

Notes:
1. Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use, Protection of Groundwater and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).
3. Detected analytical results above Unrestricted Use SCOs are bolded.
4. Detected analytical results above Protection of Groundwater SCOs are underlined.
5. Detected analytical results above Restricted Use Restricted-Residential SCOs are shaded.
7. Sample DUP01_053015 is a duplicate sample of EB07_10-12; sample 026_DUP2 is a duplicate sample of 025_LSB2_42-44; and sample 017_DUP01_042121 is a duplicate sample of 001_LSB5_0-2.
8. bgs = below grade surface
9. mg/kg = milligrams per kilogram
10. ND = Not detected

Qualifiers:
J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
130 SAINT FELIX STREET
BLOCK No. 2111, LOT No. 40
BROOKLYN NEW YORK

Drawing Title
SOIL ANALYTICAL RESULTS - ORGANICS

Project No. 100842301
Date 7/31/2024
Scale 1:360
Drawn By JF
Figure 5A

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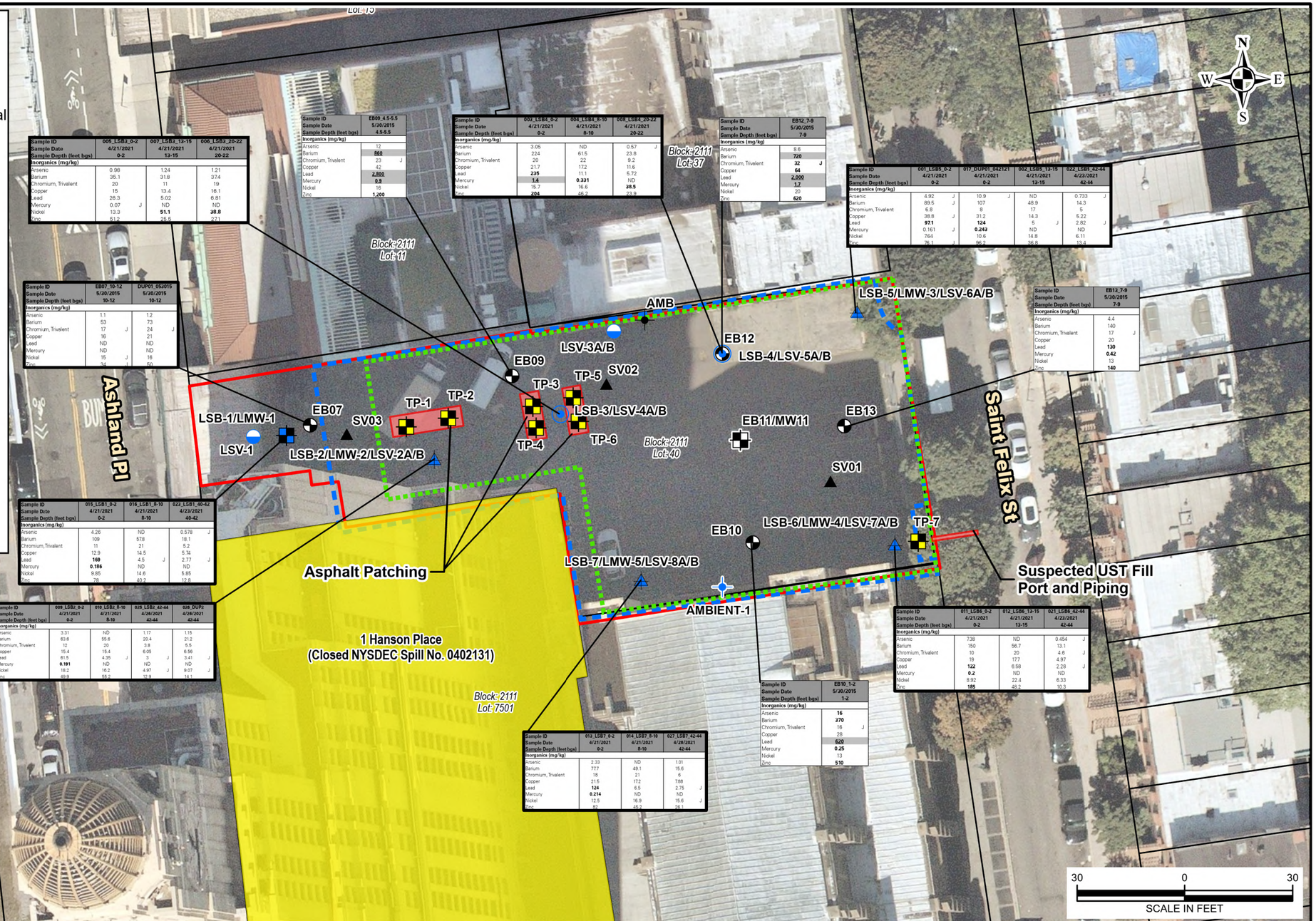
Legend

- Approximate Site Boundary
- Tax Lot
- AOC-1 - Historical Site Operations and Potential Historical Presence of USTs
- AOC-2 - Historical Adjacent and Surrounding Site Operations
- Proposed Building Extents
- Proposed Cellar Extents
- Ambient Air Sample (Langan 2015)
- Soil Boring (Langan 2015)
- Soil Vapor Sample (Langan 2015)
- Soil Boring/Monitoring Well (Langan 2015)
- Test Pit (Langan 2021)
- Ambient Air Sample 2021, Langan 2015
- Soil Boring/Monitoring Well (Langan 2021)
- Soil Boring/Soil Vapor Sample (Langan 2021)
- Soil Boring/Monitoring Well/Soil Vapor Sample (Langan 2021)
- Soil Vapor Sample (Langan 2021)



Sample ID	005_LSB3_0-2	007_LSB3_13-15	006_LSB3_20-22
Sample Date	4/21/2021	4/21/2021	4/21/2021
Sample Depth (feet bgs)	0-2	13-15	20-22
Inorganics (mg/kg)			
Arsenic	0.98	1.24	1.21
Barium	35.1	31.8	37.4
Chromium, Trivalent	20	11	19
Copper	15	13.4	16.1
Lead	26.3	5.02	6.81
Mercury	0.07 J	ND	ND
Nickel	13.3	**51.1**	**38.8**
Zinc	51.2	26.6	27.1

Sample ID	EB09_4.5-5.5
Sample Date	5/30/2015
Sample Depth (feet bgs)	4.5-5.5
Inorganics (mg/kg)	
Arsenic	12
Barium	**860**
Chromium, Trivalent	23 J
Copper	42
Lead	**2,800**
Mercury	**0.3**
Nickel	18
Zinc	**1,200**

Sample ID	003_LSB4_0-2	004_LSB4_8-10	008_LSB4_20-22
Sample Date	4/21/2021	4/21/2021	4/21/2021
Sample Depth (feet bgs)	0-2	8-10	20-22
Inorganics (mg/kg)			
Arsenic	3.05	ND	0.57 J
Barium	224	61.5	23.8
Chromium, Trivalent	20	22	9.2
Copper	21.7	17.2	11.6
Lead	**235**	11.1	5.72
Mercury	**1.6**	**0.331**	ND
Nickel	15.7	16.6	**38.5**
Zinc	**204**	46.2	23.9

Sample ID	EB12_7-9
Sample Date	5/30/2015
Sample Depth (feet bgs)	7-9
Inorganics (mg/kg)	
Arsenic	8.6
Barium	**720**
Chromium, Trivalent	**32** J
Copper	**64**
Lead	**2,000**
Mercury	**1.7**
Nickel	20
Zinc	**620**

Sample ID	001_LSB5_0-2	017_DUP01_042121	002_LSB5_13-15	022_LSB5_42-44
Sample Date	4/21/2021	4/21/2021	4/21/2021	4/23/2021
Sample Depth (feet bgs)	0-2	0-2	13-15	42-44
Inorganics (mg/kg)				
Arsenic	4.92 J	10.9 J	ND	0.733 J
Barium	89.5 J	107	48.9	14.3
Chromium, Trivalent	6.8	8	17	5
Copper	38.8 J	31.2	14.3	5.22
Lead	**97.1**	**124**	5 J	2.82 J
Mercury	0.161 J	**0.243**	ND	ND
Nickel	764	10.6	14.8	6.11
Zinc	76.1 J	96.2	36.8	13.4

Sample ID	EB07_10-12	DUP01_053015
Sample Date	5/30/2015	5/30/2015
Sample Depth (feet bgs)	10-12	10-12
Inorganics (mg/kg)		
Arsenic	1.1	1.2
Barium	53	73
Chromium, Trivalent	17 J	24 J
Copper	16	21
Lead	ND	ND
Mercury	ND	ND
Nickel	15 J	16
Zinc	34 J	50

Sample ID	EB12_7-9
Sample Date	5/30/2015
Sample Depth (feet bgs)	7-9
Inorganics (mg/kg)	
Arsenic	4.4
Barium	140
Chromium, Trivalent	17 J
Copper	20
Lead	**130**
Mercury	**0.42**
Nickel	13
Zinc	**140**

Sample ID	015_LSB1_0-2	016_LSB1_8-10	023_LSB1_40-42
Sample Date	4/21/2021	4/21/2021	4/23/2021
Sample Depth (feet bgs)	0-2	8-10	40-42
Inorganics (mg/kg)			
Arsenic	4.26	ND	0.578 J
Barium	109	578	18.1
Chromium, Trivalent	11	21	5.2
Copper	12.9	14.5	5.74
Lead	**169**	4.5 J	2.77 J
Mercury	**0.186**	ND	ND
Nickel	9.85	14.6	5.85
Zinc	78	40.2	12.8

Sample ID	009_LSB2_0-2	010_LSB2_8-10	025_LSB2_42-44	026_DUP2
Sample Date	4/21/2021	4/21/2021	4/26/2021	4/26/2021
Sample Depth (feet bgs)	0-2	8-10	42-44	42-44
Inorganics (mg/kg)				
Arsenic	3.31	ND	1.17	1.15
Barium	63.6	55.6	20.4	21.2
Chromium, Trivalent	12	20	3.8	5.5
Copper	15.4	15.4	6.05	6.56
Lead	81.8	4.35 J	3 J	3.41 J
Mercury	**0.191**	ND	ND	ND
Nickel	18.2	16.2	4.97 J	9.07 J
Zinc	49.9	55.2	12.9	14.1

Sample ID	011_LSB6_0-2	012_LSB6_13-15	021_LSB6_42-44
Sample Date	4/21/2021	4/21/2021	4/23/2021
Sample Depth (feet bgs)	0-2	13-15	42-44
Inorganics (mg/kg)			
Arsenic	7.38	ND	0.454 J
Barium	150	56.7	13.1
Chromium, Trivalent	10	20	4.6 J
Copper	19	177	4.97
Lead	**122**	6.58	2.28 J
Mercury	**0.2**	ND	ND
Nickel	8.92	22.4	6.33
Zinc	**185**	48.2	10.3

Sample ID	EB10_1-2
Sample Date	5/30/2015
Sample Depth (feet bgs)	1-2
Inorganics (mg/kg)	
Arsenic	**16**
Barium	**270**
Chromium, Trivalent	16 J
Copper	28
Lead	**620**
Mercury	**0.25**
Nickel	13
Zinc	**510**

Sample ID	012_LSB7_0-2	014_LSB7_8-10	027_LSB7_42-44
Sample Date	4/21/2021	4/21/2021	4/26/2021
Sample Depth (feet bgs)	0-2	8-10	42-44
Inorganics (mg/kg)			
Arsenic	2.33	ND	1.01
Barium	77.7	49.1	15.6
Chromium, Trivalent	18	21	6
Copper	21.5	17.2	7.88
Lead	**124**	6.5	2.75 J
Mercury	**0.214**	ND	ND
Nickel	12.5	16.9	15.6 J
Zinc	82	45.2	26.1

Notes:
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6. LSV-1 and LSV-2A through LSV-8A were installed to 5 ft bgs and LSV-2B through LSV-8B were installed to 20.5 bgs.
7. Chemboxes for samples collected during the 2021 RI are shown with a bold outline.

Analyte	NYSDEC Part 375 Unrestricted Use SCOs	NYSDEC Part 375 Protection of Groundwater SCOs	NYSDEC Part 375 Restricted Use Restricted-Residential SCOs
Inorganics (µg/L)			
Arsenic	13	16	16
Barium	350	820	400
Chromium, Trivalent	30	~	180
Copper	50	1,720	270
Lead	63	450	400
Mercury	0.18	0.73	0.81
Nickel	30	130	310
Zinc	109	2,480	10,000

Notes:
1. Soil sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (NYCRR) Part 375 Unrestricted Use, Protection of Groundwater and Restricted Use Restricted-Residential Soil Cleanup Objectives (SCO).
3. Detected analytical results above Unrestricted Use SCOs are bolded.
4. Detected analytical results above Protection of Groundwater SCOs are underlined.
5. Detected analytical results above Restricted Use Restricted-Residential SCOs are shaded.
7. Sample DUP01_053015 is a duplicate sample of EB07_10-12; sample 026_DUP2 is a duplicate sample of 025_LSB2_42-44; and sample 017_DUP01_042121 is a duplicate sample of 001_LSB5_0-2.
8. bgs = below grade surface
9. mg/kg = milligrams per kilogram
10. ND = Not detected

Qualifiers:
J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
130 SAINT FELIX STREET
BLOCK No. 2111, LOT No. 40
BROOKLYN NEW YORK

Drawing Title
SUBSURFACE INVESTIGATION AND REMEDIAL INVESTIGATION SOIL ANALYTICAL RESULTS - INORGANICS

Project No. 100842301
Date 7/31/2024
Scale 1:360
Drawn By JF
Figure 5B

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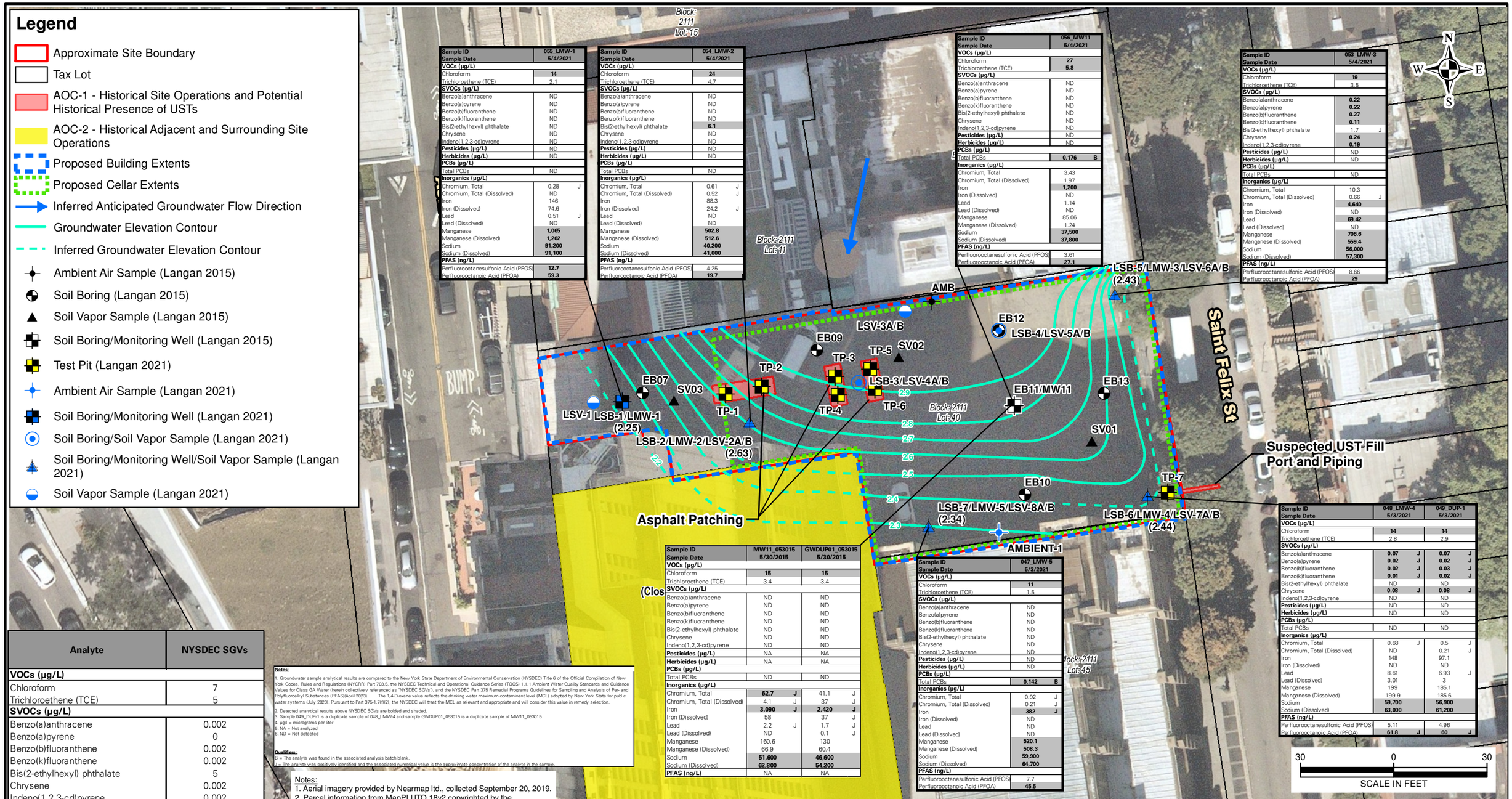

Sample ID	055_LMW-1	
Sample Date	5/4/2021	
VOCs (µg/L)		
Chloroform	14	
Trichloroethene (TCE)	2.1	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Bis(2-ethylhexyl) phthalate	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Pesticides (µg/L)	ND	
Herbicides (µg/L)	ND	
PCBs (µg/L)		
Total PCBs	ND	
Inorganics (µg/L)		
Chromium, Total	0.28	J
Chromium, Total (Dissolved)	ND	
Iron	146	
Iron (Dissolved)	74.6	
Lead	0.51	J
Lead (Dissolved)	ND	
Manganese	1,065	
Manganese (Dissolved)	1,202	
Sodium	91,200	
Sodium (Dissolved)	91,100	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	12.7	
Perfluorooctanoic Acid (PFOA)	59.3	

Sample ID	054_LMW-2	
Sample Date	5/4/2021	
VOCs (µg/L)		
Chloroform	24	
Trichloroethene (TCE)	4.7	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Bis(2-ethylhexyl) phthalate	6.1	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Pesticides (µg/L)	ND	
Herbicides (µg/L)	ND	
PCBs (µg/L)		
Total PCBs	ND	
Inorganics (µg/L)		
Chromium, Total	0.61	J
Chromium, Total (Dissolved)	0.52	J
Iron	88.3	
Iron (Dissolved)	24.2	J
Lead	ND	
Lead (Dissolved)	ND	
Manganese	502.8	
Manganese (Dissolved)	512.6	
Sodium	40,200	
Sodium (Dissolved)	41,000	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	4.25	
Perfluorooctanoic Acid (PFOA)	19.7	

Sample ID	056_MW11	
Sample Date	5/4/2021	
VOCs (µg/L)		
Chloroform	27	
Trichloroethene (TCE)	5.8	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Bis(2-ethylhexyl) phthalate	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Pesticides (µg/L)	ND	
Herbicides (µg/L)	ND	
PCBs (µg/L)		
Total PCBs	0.176	B
Inorganics (µg/L)		
Chromium, Total	3.43	
Chromium, Total (Dissolved)	1.97	
Iron	1,200	
Iron (Dissolved)	ND	
Lead	1.14	
Lead (Dissolved)	ND	
Manganese	85.06	
Manganese (Dissolved)	1.24	
Sodium	37,500	
Sodium (Dissolved)	37,800	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	3.61	
Perfluorooctanoic Acid (PFOA)	27.1	

Sample ID	053_LMW-3	
Sample Date	5/4/2021	
VOCs (µg/L)		
Chloroform	19	
Trichloroethene (TCE)	3.5	
SVOCs (µg/L)		
Benzo(a)anthracene	0.22	
Benzo(a)pyrene	0.22	
Benzo(b)fluoranthene	0.27	
Benzo(k)fluoranthene	0.11	
Bis(2-ethylhexyl) phthalate	1.7	J
Chrysene	0.24	
Indeno(1,2,3-cd)pyrene	0.19	
Pesticides (µg/L)	ND	
Herbicides (µg/L)	ND	
PCBs (µg/L)		
Total PCBs	ND	
Inorganics (µg/L)		
Chromium, Total	10.3	
Chromium, Total (Dissolved)	0.66	J
Iron	4,640	
Iron (Dissolved)	ND	
Lead	69.42	
Lead (Dissolved)	ND	
Manganese	706.6	
Manganese (Dissolved)	559.4	
Sodium	56,000	
Sodium (Dissolved)	57,300	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	8.66	
Perfluorooctanoic Acid (PFOA)	29	

Sample ID	048_LMW-4		049_DUP-1	
Sample Date	5/3/2021		5/3/2021	
VOCs (µg/L)				
Chloroform	14		14	
Trichloroethene (TCE)	2.8		2.9	
SVOCs (µg/L)				
Benzo(a)anthracene	0.07	J	0.07	J
Benzo(a)pyrene	0.02	J	0.02	J
Benzo(b)fluoranthene	0.02	J	0.03	J
Benzo(k)fluoranthene	0.01	J	0.02	J
Bis(2-ethylhexyl) phthalate	ND		ND	
Chrysene	0.08	J	0.08	J
Indeno(1,2,3-cd)pyrene	ND		ND	
Pesticides (µg/L)	ND		ND	
Herbicides (µg/L)	ND		ND	
PCBs (µg/L)				
Total PCBs	ND		ND	
Inorganics (µg/L)				
Chromium, Total	0.68	J	0.5	J
Chromium, Total (Dissolved)	ND		0.21	J
Iron	148		97.1	
Iron (Dissolved)	ND		ND	
Lead	8.61		6.93	J
Lead (Dissolved)	3.01		3	
Manganese	199		185.1	
Manganese (Dissolved)	199.9		185.6	
Sodium	59,700		56,900	
Sodium (Dissolved)	63,000		61,200	
PFAS (ng/L)				
Perfluorooctanesulfonic Acid (PFOS)	5.11		4.96	
Perfluorooctanoic Acid (PFOA)	61.8	J	60	J

Sample ID	MW11_053015		GWDUP01_053015	
Sample Date	5/30/2015		5/30/2015	
VOCs (µg/L)				
Chloroform	15		15	
Trichloroethene (TCE)	3.4		3.4	
SVOCs (µg/L)				
Benzo(a)anthracene	ND		ND	
Benzo(a)pyrene	ND		ND	
Benzo(b)fluoranthene	ND		ND	
Benzo(k)fluoranthene	ND		ND	
Bis(2-ethylhexyl) phthalate	ND		ND	
Chrysene	ND		ND	
Indeno(1,2,3-cd)pyrene	ND		ND	
Pesticides (µg/L)	NA		NA	
Herbicides (µg/L)	NA		NA	
PCBs (µg/L)				
Total PCBs	ND		ND	
Inorganics (µg/L)				
Chromium, Total	62.7	J	41.1	J
Chromium, Total (Dissolved)	4.1	J	37	J
Iron	3,090	J	2,420	J
Iron (Dissolved)	58		37	J
Lead	2.2	J	1.7	J
Lead (Dissolved)	ND		0.1	J
Manganese	160.6		130	
Manganese (Dissolved)	66.9		60.4	
Sodium	51,600		46,600	
Sodium (Dissolved)	62,800		54,200	
PFAS (ng/L)	NA		NA	

Sample ID	047_LMW-5	
Sample Date	5/3/2021	
VOCs (µg/L)		
Chloroform	11	
Trichloroethene (TCE)	1.5	
SVOCs (µg/L)		
Benzo(a)anthracene	ND	
Benzo(a)pyrene	ND	
Benzo(b)fluoranthene	ND	
Benzo(k)fluoranthene	ND	
Bis(2-ethylhexyl) phthalate	ND	
Chrysene	ND	
Indeno(1,2,3-cd)pyrene	ND	
Pesticides (µg/L)	ND	
Herbicides (µg/L)	ND	
PCBs (µg/L)		
Total PCBs	0.142	B
Inorganics (µg/L)		
Chromium, Total	0.92	J
Chromium, Total (Dissolved)	0.21	J
Iron	382	J
Iron (Dissolved)	ND	
Lead	ND	
Lead (Dissolved)	ND	
Manganese	520.1	
Manganese (Dissolved)	508.3	
Sodium	59,900	
Sodium (Dissolved)	64,700	
PFAS (ng/L)		
Perfluorooctanesulfonic Acid (PFOS)	7.7	
Perfluorooctanoic Acid (PFOA)	45.5	

Analyte	NYSDEC SGVs
VOCs (µg/L)	
Chloroform	7
Trichloroethene (TCE)	5
SVOCs (µg/L)	
Benzo(a)anthracene	0.002
Benzo(a)pyrene	0
Benzo(b)fluoranthene	0.002
Benzo(k)fluoranthene	0.002
Bis(2-ethylhexyl) phthalate	5
Chrysene	0.002
Indeno(1,2,3-cd)pyrene	0.002
PCBs (µg/L)	
Total PCBs	0.09
Inorganics (µg/L)	
Chromium, Total	50
Iron	300
Lead	25
Manganese	300
Sodium	20,000
PFAS (µg/L)	
Perfluorooctanesulfonic Acid (PFOS)	0.0027
Perfluorooctanoic Acid (PFOA)	0.0067

Notes:

1. Groundwater sample analytical results are compared to the New York State Department of Environmental Conservation (NYSDEC) Title 6 of the Official Compilation of New York Codes, Rules and Regulations (NYCRR) Part 703.5, the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water (herein collectively referenced as "NYSDEC SGVs"), and the NYSDEC Part 375 Remedial Programs Guidelines for Sampling and Analysis of Per- and Polyfluoroalkyl Substances (PFAS)(April 2023). The 1,4-Dioxane value reflects the drinking water maximum contaminant level (MCL) adopted by New York State for public water systems (July 2020). Pursuant to Part 375-1.7(f)(2), the NYSDEC will treat the MCL as relevant and appropriate and will consider this value in remedy selection.

2. Detected analytical results above NYSDEC SGVs are bolded and shaded.
3. Sample 049_DUP-1 is a duplicate sample of 048_LMW-4 and sample GWDUP01_053015 is a duplicate sample of MW11_053015.
4. µg/l = micrograms per liter
5. NA = Not analyzed
6. ND = Not detected

Qualifiers:

B = The analyte was found in the associated analysis batch blank.
J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

Notes:

1. Aerial imagery provided by Nearmap ltd., collected September 20, 2019.
2. Parcel information from MapPLUTO 18v2 copyrighted by the New York City Department of Planning.
3. Historic sample locations from June 2015 Subsurface Investigation Report, prepared by Langan.
4. All sample locations are approximate and based on field measurements.
5. All monitoring well elevations were collected using classic survey techniques.
6. UST fill port and piping were detected during NOVA's 2020 Geophysical Survey. Approximate locations of asphalt patches are based on field observations made by Langan in 2020.
7. Chemboxes for samples collected during the 2021 RI are shown with a bold outline.
8. Groundwater elevations are referenced to the North American Vertical Datum of 1988.
9. Site boundary extents are based on Metes and Bounds Description provided by True North Surveyors, P.C.

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
130 SAINT FELIX STREET
BLOCK No. 2111, Portion of LOT No. 40
BROOKLYN NEW YORK

Drawing Title
GROUNDWATER ANALYTICAL RESULTS

Project No. 100842301
Date 7/31/2024
Scale 1 " = 30 '
Drawn By IHB
Figure 6

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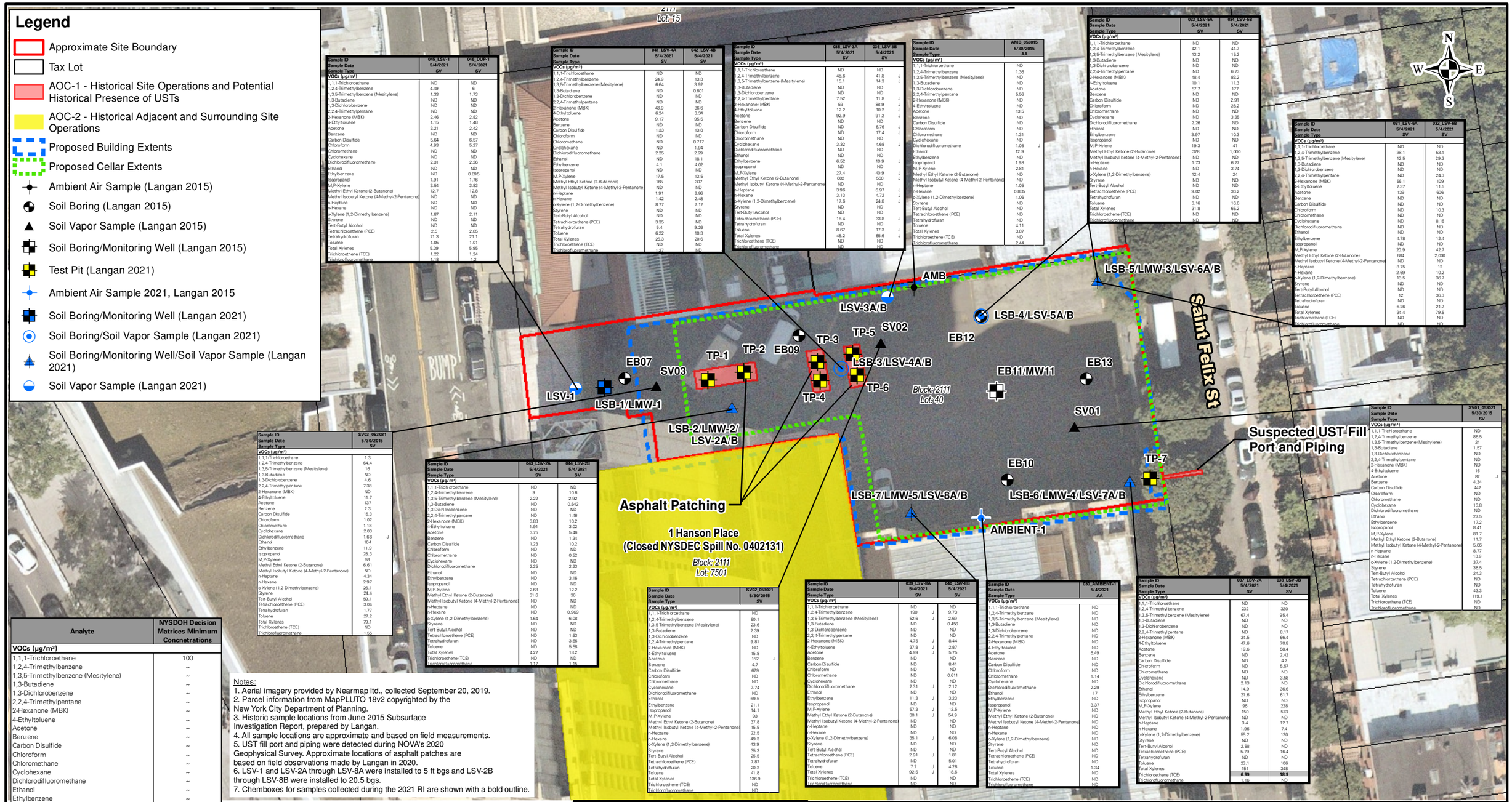

Sample ID	045_LSV-1	046_DUP-1
Sample Date	5/4/2021	5/4/2021
Sample Type	SV	SV
VOCs (µg/m³)		
1,1,1-Trichloroethane	ND	ND
1,2,4-Trimethylbenzene	4.49	6
1,3,5-Trimethylbenzene (Mesitylene)	1.33	1.73
1,3-Butadiene	ND	ND
1,3-Dichlorobenzene	ND	ND
2,2,4-Trimethylpentane	ND	ND
2-Hexanone (MBK)	2.46	2.82
4-Ethyltoluene	1.15	1.48
Acetone	3.21	2.42
Benzene	ND	ND
Carbon Disulfide	5.64	6.57
Chloroform	4.93	5.27
Chloromethane	ND	ND
Cyclohexane	ND	ND
Dichlorodifluoromethane	2.31	2.26
Ethanol	ND	ND
Ethylbenzene	ND	0.895
Isopropanol	1.91	1.76
M,P-Xylene	3.54	3.83
Methyl Ethyl Ketone (2-Butanone)	12.7	12.8
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND	ND
n-Heptane	ND	ND
n-Hexane	ND	ND
o-Xylene (1,2-Dimethylbenzene)	1.87	2.11
Styrene	ND	ND
Tert-Butyl Alcohol	ND	ND
Tetrachloroethene (PCE)	2.5	2.85
Tetrahydrofuran	21.3	21.1
Toluene	1.05	1.01
Total Xylenes	5.39	5.95
Trichloroethene (TCE)	1.22	1.24
Trichlorofluoromethane	1.18	1.2

Sample ID	041_LSV-4A	042_LSV-4B
Sample Date	5/4/2021	5/4/2021
Sample Type	SV	SV
VOCs (µg/m³)		
1,1,1-Trichloroethane	ND	ND
1,2,4-Trimethylbenzene	24.9	13.3
1,3,5-Trimethylbenzene (Mesitylene)	6.64	3.92
1,3-Butadiene	ND	0.801
1,3-Dichlorobenzene	ND	ND
2,2,4-Trimethylpentane	ND	ND
2-Hexanone (MBK)	43.9	36.6
4-Ethyltoluene	6.24	3.34
Acetone	9.17	95.5
Benzene	ND	ND
Carbon Disulfide	1.33	13.8
Chloroform	ND	ND
Chloromethane	ND	0.717
Cyclohexane	ND	1.94
Dichlorodifluoromethane	2.25	2.29
Ethanol	ND	18.1
Ethylbenzene	4.1	4.02
Isopropanol	ND	ND
M,P-Xylene	17.5	13.5
Methyl Ethyl Ketone (2-Butanone)	185	307
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND	ND
n-Heptane	1.91	2.86
n-Hexane	1.42	2.48
o-Xylene (1,2-Dimethylbenzene)	8.77	7.12
Styrene	ND	ND
Tert-Butyl Alcohol	ND	ND
Tetrachloroethene (PCE)	3.35	ND
Tetrahydrofuran	5.4	9.26
Toluene	6.22	10.3
Total Xylenes	26.3	20.6
Trichloroethene (TCE)	ND	ND
Trichlorofluoromethane	1.27	ND

Sample ID	035_LSV-3A	036_LSV-3B
Sample Date	5/4/2021	5/4/2021
Sample Type	SV	SV
VOCs (µg/m³)		
1,1,1-Trichloroethane	ND	ND
1,2,4-Trimethylbenzene	48.6	41.8 J
1,3,5-Trimethylbenzene (Mesitylene)	15.1	14.3 J
1,3-Butadiene	ND	ND
1,3-Dichlorobenzene	ND	ND
2,2,4-Trimethylpentane	7.52	11.8 J
2-Hexanone (MBK)	59	88.9 J
4-Ethyltoluene	12.2	10.2 J
Acetone	92.9	91.2 J
Benzene	ND	ND
Carbon Disulfide	ND	6.76 J
Chloroform	ND	17.4 J
Chloromethane	ND	ND
Cyclohexane	3.32	4.68 J
Dichlorodifluoromethane	ND	ND
Ethanol	ND	ND
Ethylbenzene	6.52	10.9 J
Isopropanol	ND	ND
M,P-Xylene	27.4	40.9 J
Methyl Ethyl Ketone (2-Butanone)	602	560 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND	ND
n-Heptane	3.96	6.97 J
n-Hexane	3.13	4.72 J
o-Xylene (1,2-Dimethylbenzene)	17.6	24.8 J
Styrene	ND	ND
Tert-Butyl Alcohol	ND	ND
Tetrachloroethene (PCE)	18.4	33.8 J
Tetrahydrofuran	ND	ND
Toluene	8.67	17.3 J
Total Xylenes	45.2	65.6 J
Trichloroethene (TCE)	ND	ND
Trichlorofluoromethane	ND	ND

Sample ID	AMB_053015
Sample Date	5/30/2015
Sample Type	AA
VOCs (µg/m³)	
1,1,1-Trichloroethane	ND
1,2,4-Trimethylbenzene	1.36
1,3,5-Trimethylbenzene (Mesitylene)	ND
1,3-Butadiene	ND
1,3-Dichlorobenzene	ND
2,2,4-Trimethylpentane	5.56
2-Hexanone (MBK)	ND
4-Ethyltoluene	ND
Acetone	13.5
Benzene	ND
Carbon Disulfide	ND
Chloroform	ND
Chloromethane	1.31
Cyclohexane	ND
Dichlorodifluoromethane	1.05 J
Ethanol	378
Ethylbenzene	ND
Isopropanol	1.98
M,P-Xylene	2.81
Methyl Ethyl Ketone (2-Butanone)	ND
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND
n-Heptane	1.05
n-Hexane	0.835
o-Xylene (1,2-Dimethylbenzene)	1.06
Styrene	ND
Tert-Butyl Alcohol	ND
Tetrachloroethene (PCE)	ND
Tetrahydrofuran	ND
Toluene	4.11
Total Xylenes	3.87
Trichloroethene (TCE)	ND
Trichlorofluoromethane	2.44

Sample ID	033_LSV-5A	034_LSV-5B
Sample Date	5/4/2021	5/4/2021
Sample Type	SV	SV
VOCs (µg/m³)		
1,1,1-Trichloroethane	ND	ND
1,2,4-Trimethylbenzene	42.1	41.7
1,3,5-Trimethylbenzene (Mesitylene)	13.2	15.2
1,3-Butadiene	ND	ND
1,3-Dichlorobenzene	ND	ND
2,2,4-Trimethylpentane	ND	6.73
2-Hexanone (MBK)	48.4	63.2
4-Ethyltoluene	10.1	11.3
Acetone	57.7	177
Benzene	ND	ND
Carbon Disulfide	ND	2.91
Chloroform	ND	28.2
Chloromethane	ND	ND
Cyclohexane	ND	3.36
Dichlorodifluoromethane	2.26	ND
Ethanol	ND	ND
Ethylbenzene	3.97	10.3
Isopropanol	ND	ND
M,P-Xylene	19.3	41
Methyl Ethyl Ketone (2-Butanone)	378	1,000
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND	ND
n-Heptane	1.73	6.27
n-Hexane	ND	3.74
o-Xylene (1,2-Dimethylbenzene)	12.4	24
Styrene	ND	ND
Tert-Butyl Alcohol	ND	ND
Tetrachloroethene (PCE)	9.02	30.2
Tetrahydrofuran	ND	ND
Toluene	3.16	16.6
Total Xylenes	31.8	65.2
Trichloroethene (TCE)	ND	ND
Trichlorofluoromethane	ND	ND

Sample ID	031_LSV-6A	032_LSV-6B
Sample Date	5/4/2021	5/4/2021
Sample Type	SV	SV
VOCs (µg/m³)		
1,1,1-Trichloroethane	ND	ND
1,2,4-Trimethylbenzene	38.1	53.1
1,3,5-Trimethylbenzene (Mesitylene)	12.5	29.3
1,3-Butadiene	ND	ND
1,3-Dichlorobenzene	ND	ND
2,2,4-Trimethylpentane	ND	24.3
2-Hexanone (MBK)	56.1	109
4-Ethyltoluene	7.37	11.5
Acetone	139	606
Benzene	ND	ND
Carbon Disulfide	ND	ND
Chloroform	ND	10.3
Chloromethane	ND	ND
Cyclohexane	ND	8.16
Dichlorodifluoromethane	ND	ND
Ethanol	ND	ND
Ethylbenzene	4.78	12.4
Isopropanol	ND	ND
M,P-Xylene	20.9	42.7
Methyl Ethyl Ketone (2-Butanone)	684	2,000
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND	ND
n-Heptane	3.76	12
n-Hexane	2.69	10.2
o-Xylene (1,2-Dimethylbenzene)	13.5	36.7
Styrene	ND	ND
Tert-Butyl Alcohol	ND	ND
Tetrachloroethene (PCE)	12	36.3
Tetrahydrofuran	ND	ND
Toluene	6.26	21.7
Total Xylenes	34.4	79.5
Trichloroethene (TCE)	ND	ND
Trichlorofluoromethane	ND	ND

Sample ID	SV03_053021
Sample Date	5/30/2015
Sample Type	SV
VOCs (µg/m³)	
1,1,1-Trichloroethane	1.3
1,2,4-Trimethylbenzene	64.4
1,3,5-Trimethylbenzene (Mesitylene)	16
1,3-Butadiene	ND
1,3-Dichlorobenzene	4.6
2,2,4-Trimethylpentane	7.38
2-Hexanone (MBK)	ND
4-Ethyltoluene	11.7
Acetone	137
Benzene	2.3
Carbon Disulfide	15.3
Chloroform	1.02
Chloromethane	1.18
Cyclohexane	2.03
Dichlorodifluoromethane	1.68 J
Ethanol	164
Ethylbenzene	11.9
Isopropanol	28.3
M,P-Xylene	53
Methyl Ethyl Ketone (2-Butanone)	6.61
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND
n-Heptane	4.34
n-Hexane	2.97
o-Xylene (1,2-Dimethylbenzene)	26.1
Styrene	24.4
Tert-Butyl Alcohol	59.1
Tetrachloroethene (PCE)	3.04
Tetrahydrofuran	1.77
Toluene	27.2
Total Xylenes	79.1
Trichloroethene (TCE)	ND
Trichlorofluoromethane	1.55

Sample ID	043_LSV-2A	044_LSV-2B
Sample Date	5/4/2021	5/4/2021
Sample Type	SV	SV
VOCs (µg/m³)		
1,1,1-Trichloroethane	ND	ND
1,2,4-Trimethylbenzene	9	10.6
1,3,5-Trimethylbenzene (Mesitylene)	2.22	2.92
1,3-Butadiene	ND	0.642
1,3-Dichlorobenzene	ND	ND
2,2,4-Trimethylpentane	ND	1.46
2-Hexanone (MBK)	3.83	10.2
4-Ethyltoluene	1.91	3.02
Acetone	3.75	5.46
Benzene	ND	1.34
Carbon Disulfide	1.23	10.2
Chloroform	ND	ND
Chloromethane	ND	0.52
Cyclohexane	ND	ND
Dichlorodifluoromethane	2.25	2.23
Ethanol	ND	ND
Ethylbenzene	ND	3.16
Isopropanol	ND	ND
M,P-Xylene	2.63	12.2
Methyl Ethyl Ketone (2-Butanone)	31.6	36
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND	ND
n-Heptane	ND	ND
n-Hexane	ND	0.969
o-Xylene (1,2-Dimethylbenzene)	1.64	6.08
Styrene	ND	ND
Tert-Butyl Alcohol	ND	ND
Tetrachloroethene (PCE)	ND	1.63
Tetrahydrofuran	ND	3.66
Toluene	ND	5.58
Total Xylenes	4.27	18.2
Trichloroethene (TCE)	ND	ND
Trichlorofluoromethane	1.17	1.15

Sample ID	SV02_053021
Sample Date	5/30/2015
Sample Type	SV
VOCs (µg/m³)	
1,1,1-Trichloroethane	ND
1,2,4-Trimethylbenzene	80.1
1,3,5-Trimethylbenzene (Mesitylene)	23.6
1,3-Butadiene	2.39
1,3-Dichlorobenzene	ND
2,2,4-Trimethylpentane	9.81
2-Hexanone (MBK)	ND
4-Ethyltoluene	15.8
Acetone	152 J
Benzene	4.7
Carbon Disulfide	679
Chloroform	ND
Chloromethane	ND
Cyclohexane	7.74
Dichlorodifluoromethane	ND
Ethanol	69.5
Ethylbenzene	21.1
Isopropanol	14.1
M,P-Xylene	93
Methyl Ethyl Ketone (2-Butanone)	37.8
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	15.5
n-Heptane	22.5
n-Hexane	49.3
o-Xylene (1,2-Dimethylbenzene)	43.9
Styrene	35.3
Tert-Butyl Alcohol	25.5
Tetrachloroethene (PCE)	7.87
Tetrahydrofuran	20.2
Toluene	41.8
Total Xylenes	136.9
Trichloroethene (TCE)	ND
Trichlorofluoromethane	ND

Sample ID	039_LSV-8A	040_LSV-8B
Sample Date	5/4/2021	5/4/2021
Sample Type	SV	SV
VOCs (µg/m³)		
1,1,1-Trichloroethane	ND	ND
1,2,4-Trimethylbenzene	190 J	9.73
1,3,5-Trimethylbenzene (Mesitylene)	52.6 J	2.69
1,3-Butadiene	ND	0.456
1,3-Dichlorobenzene	ND	ND
2,2,4-Trimethylpentane	ND	ND
2-Hexanone (MBK)	4.75 J	8.44
4-Ethyltoluene	37.8 J	2.87
Acetone	4.99 J	5.75
Benzene	ND	ND
Carbon Disulfide	ND	8.41
Chloroform	ND	ND
Chloromethane	ND	0.611
Cyclohexane	ND	ND
Dichlorodifluoromethane	2.31 J	2.12
Ethanol	ND	ND
Ethylbenzene	11.3 J	3.23
Isopropanol	ND	ND
M,P-Xylene	57.3 J	12.5
Methyl Ethyl Ketone (2-Butanone)	30.1 J	54.9
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND	ND
n-Heptane	ND	ND
n-Hexane	ND	ND
o-Xylene (1,2-Dimethylbenzene)	35.1 J	6.08
Styrene	ND	ND
Tert-Butyl Alcohol	ND	ND
Tetrachloroethene (PCE)	2.91 J	1.81
Tetrahydrofuran	ND	5.01
Toluene	7.2 J	4.26
Total Xylenes	92.5 J	18.6
Trichloroethene (TCE)	ND	ND
Trichlorofluoromethane	ND	ND

Sample ID	030_AMBIENT-1
Sample Date	5/4/2021
Sample Type	AA
VOCs (µg/m³)	
1,1,1-Trichloroethane	ND
1,2,4-Trimethylbenzene	ND
1,3,5-Trimethylbenzene (Mesitylene)	ND
1,3-Butadiene	ND
1,3-Dichlorobenzene	ND
2,2,4-Trimethylpentane	ND
2-Hexanone (MBK)	ND
4-Ethyltoluene	ND
Acetone	6.49
Benzene	ND
Carbon Disulfide	ND
Chloroform	ND
Chloromethane	1.14
Cyclohexane	ND
Dichlorodifluoromethane	2.29
Ethanol	17
Ethylbenzene	ND
Isopropanol	3.37
M,P-Xylene	ND
Methyl Ethyl Ketone (2-Butanone)	ND
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND
n-Heptane	ND
n-Hexane	ND
o-Xylene (1,2-Dimethylbenzene)	ND
Styrene	ND
Tert-Butyl Alcohol	ND
Tetrachloroethene (PCE)	ND
Tetrahydrofuran	ND
Toluene	1.34
Total Xylenes	ND
Trichloroethene (TCE)	ND
Trichlorofluoromethane	ND

Sample ID	037_LSV-7A	038_LSV-7B
Sample Date	5/4/2021	5/4/2021
Sample Type	SV	SV
VOCs (µg/m³)		
1,1,1-Trichloroethane	ND	ND
1,2,4-Trimethylbenzene	232	320
1,3,5-Trimethylbenzene (Mesitylene)	67.4	95.4
1,3-Butadiene	ND	ND
1,3-Dichlorobenzene	ND	ND
2,2,4-Trimethylpentane	ND	8.17
2-Hexanone (MBK)	34.5	66.4
4-Ethyltoluene	47.6	70.8
Acetone	19.6	58.4
Benzene	ND	2.42
Carbon Disulfide	ND	4.2
Chloroform	ND	5.57
Chloromethane	ND	ND
Cyclohexane	ND	3.58
Dichlorodifluoromethane	2.13	ND
Ethanol	14.9	36.6
Ethylbenzene	21.6	61.7
Isopropanol	ND	ND
M,P-Xylene	96	228
Methyl Ethyl Ketone (2-Butanone)	150	513
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	ND	ND
n-Heptane	3.4	12.7
n-Hexane	1.96	7.4
o-Xylene (1,2-Dimethylbenzene)	55.2	120
Styrene	ND	ND
Tert-Butyl Alcohol	2.88	ND
Tetrachloroethene (PCE)	5.79	16.4
Tetrahydrofuran	ND	ND
Toluene	23.1	106
Total Xylenes	151	348
Trichloroethene (TCE)	**6.99**	**18.9**
Trichlorofluoromethane	1.16	ND

Sample ID	SV01_053021
Sample Date	5/30/2015
Sample Type	SV
VOCs (µg/m³)	
1,1,1-Trichloroethane	ND
1,2,4-Trimethylbenzene	86.5
1,3,5-Trimethylbenzene (Mesitylene)	24
1,3-Butadiene	1.57
1,3-Dichlorobenzene	ND
2,2,4-Trimethylpentane	ND
2-Hexanone (MBK)	ND
4-Ethyltoluene	16
Acetone	82 J
Benzene	4.34
Carbon Disulfide	442
Chloroform	ND
Chloromethane	ND
Cyclohexane	13.8
Dichlorodifluoromethane	ND
Ethanol	27.5
Ethylbenzene	17.2
Isopropanol	8.41
M,P-Xylene	81.7
Methyl Ethyl Ketone (2-Butanone)	11.7
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	5.66
n-Heptane	8.77
n-Hexane	13.9
o-Xylene (1,2-Dimethylbenzene)	37.4
Styrene	38.5
Tert-Butyl Alcohol	24.3
Tetrachloroethene (PCE)	ND
Tetrahydrofuran	ND
Toluene	43.3
Total Xylenes	119.1
Trichloroethene (TCE)	ND
Trichlorofluoromethane	ND

Analyte	NYSDOH Decision Matrices Minimum Concnetrations
VOCs (µg/m³)	
1,1,1-Trichloroethane	100
1,2,4-Trimethylbenzene	~
1,3,5-Trimethylbenzene (Mesitylene)	~
1,3-Butadiene	~
1,3-Dichlorobenzene	~
2,2,4-Trimethylpentane	~
2-Hexanone (MBK)	~
4-Ethyltoluene	~
Acetone	~
Benzene	~
Carbon Disulfide	~
Chloroform	~
Chloromethane	~
Cyclohexane	~
Dichlorodifluoromethane	~
Ethanol	~
Ethylbenzene	~
Isopropanol	~
M,P-Xylene	~
Methyl Ethyl Ketone (2-Butanone)	~
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	~
n-Heptane	~
n-Hexane	~
o-Xylene (1,2-Dimethylbenzene)	~
Styrene	~
Tert-Butyl Alcohol	~
Tetrachloroethene (PCE)	100
Tetrahydrofuran	~
Toluene	~
Total Xylenes	~
Trichloroethene (TCE)	6
Trichlorofluoromethane	~

Notes:
1. Aerial imagery provided by Nearmap ltd., collected September 20, 2019.
2. Parcel information from MapPLUTO 18v2 copyrighted by the New York City Department of Planning.
3. Historic sample locations from June 2015 Subsurface Investigation Report, prepared by Langan.
4. All sample locations are approximate and based on field measurements.
5. UST fill port and piping were detected during NOVA's 2020 Geophysical Survey. Approximate locations of asphalt patches are based on field observations made by Langan in 2020.
6. LSV-1 and LSV-2A through LSV-8A were installed to 5 ft bgs and LSV-2B through LSV-8B were installed to 20.5 bgs.
7. Chemboxes for samples collected during the 2021 RI are shown with a bold outline.

30 0 30
SCALE IN FEET

Notes:
1. Soil vapor sample analytical results are compared to the minimum soil vapor concentrations at which mitigation is recommended as set forth in the New York State Department of Health (NYSDOH) October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York Decision Matrices for Sub-Slab Vapor and Indoor Air and subsequent updates (2017).
2. Ambient air sample analytical results are shown for reference only.
3. Detected analytical results above the minimum soil vapor concentrations recommending mitigation are bolded and shaded.
4. Sample 046_DUP-1 is a duplicate of parent sample 045_LSV-1.
5. ~ = Regulatory limit for this analyte does not exist
6. µg/m³ = micrograms per cubic meter
7. AA = Ambient Air
8. SV = Soil Vapor

Qualifiers:
J = The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
130 SAINT FELIX STREET
BLOCK No. 2111, LOT No. 40
BROOKLYN NEW YORK

Drawing Title
SOIL VAPOR ANALYTICAL RESULTS

Project No. 100842301
Date 7/31/2024
Scale 1 " = 30 '
Drawn By JF
Figure 7

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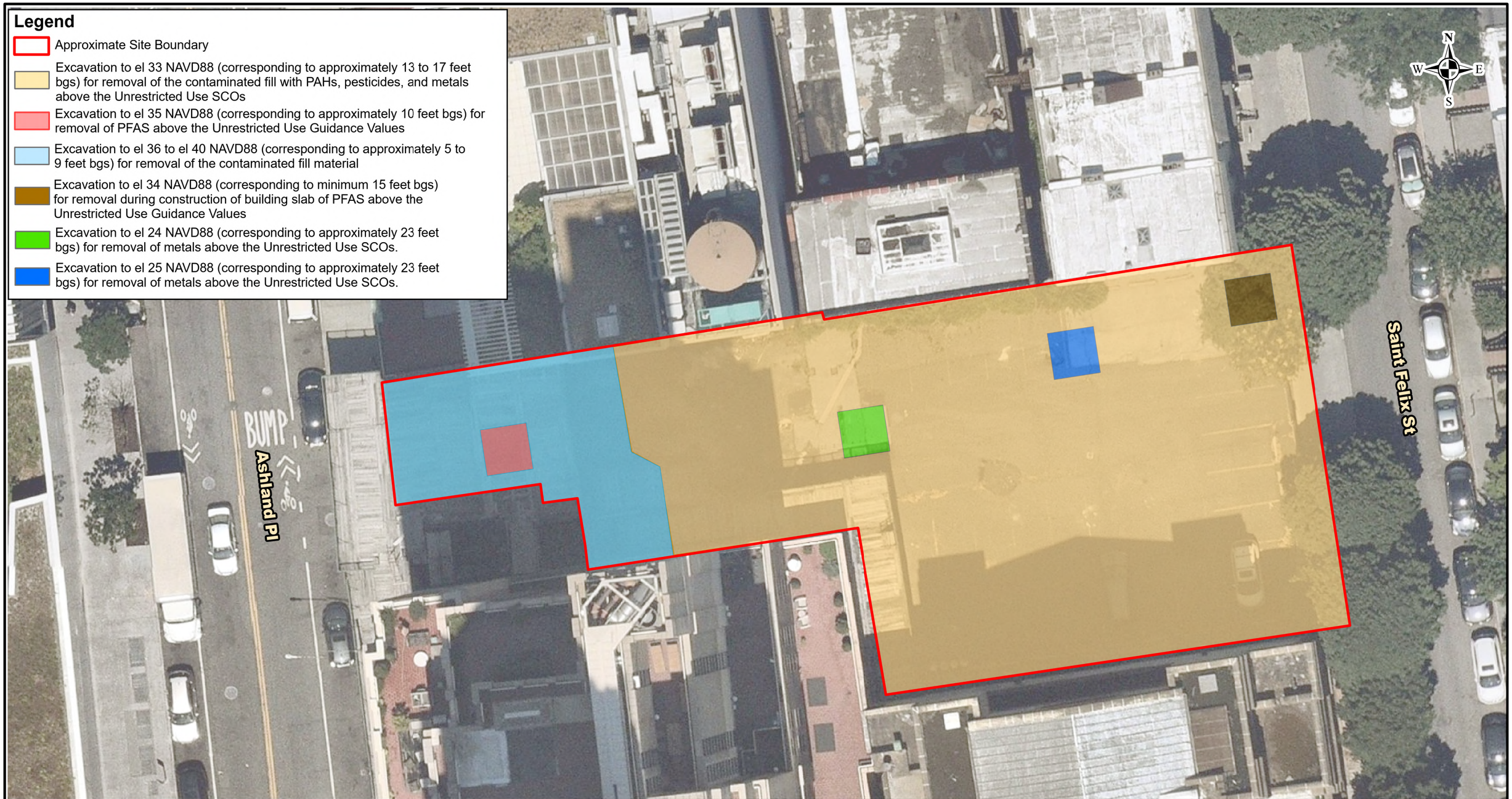
Path: \\langan.com\data\PAR\data3\100842301\Project Data\ArcGIS\MXD\Environmental_Figures\2020-06 - RIR\Figure 8 - Subsurface Investigation and Remedial Investigation Soil Vapor Analytical Results.mxd Date: 7/31/2024 User: ibaker Time: 12:03:06 PM



20 0 20
SCALE IN FEET

Notes:
1. Aerial imagery provided through Langan's subscription to Nearmap, dated 19 July 2022.
2. Parcel information from MapPLUTO 18v2 copyrighted by the New York City Department of Planning.
3. Site boundary extents are based on Metes and Bounds Description provided by True North Surveyors, P.C.
4. Elevation data based on the "Support of Excavation General Plan" SOE 101.00 prepared by FX Collaborative Architects LLC as dated 22 April 2022 and submitted 22 July 2022.

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Project
130 SAINT FELIX STREET
BLOCK No. 2111, Portion of LOT No. 40
BROOKLYN NEW YORK

Drawing Title
ALTERNATIVE I - TRACK 1 CLEANUP

Project No.	100842301
Date	7/31/2024
Scale	1" = 20 feet
Drawn By	PDT
Figure	8

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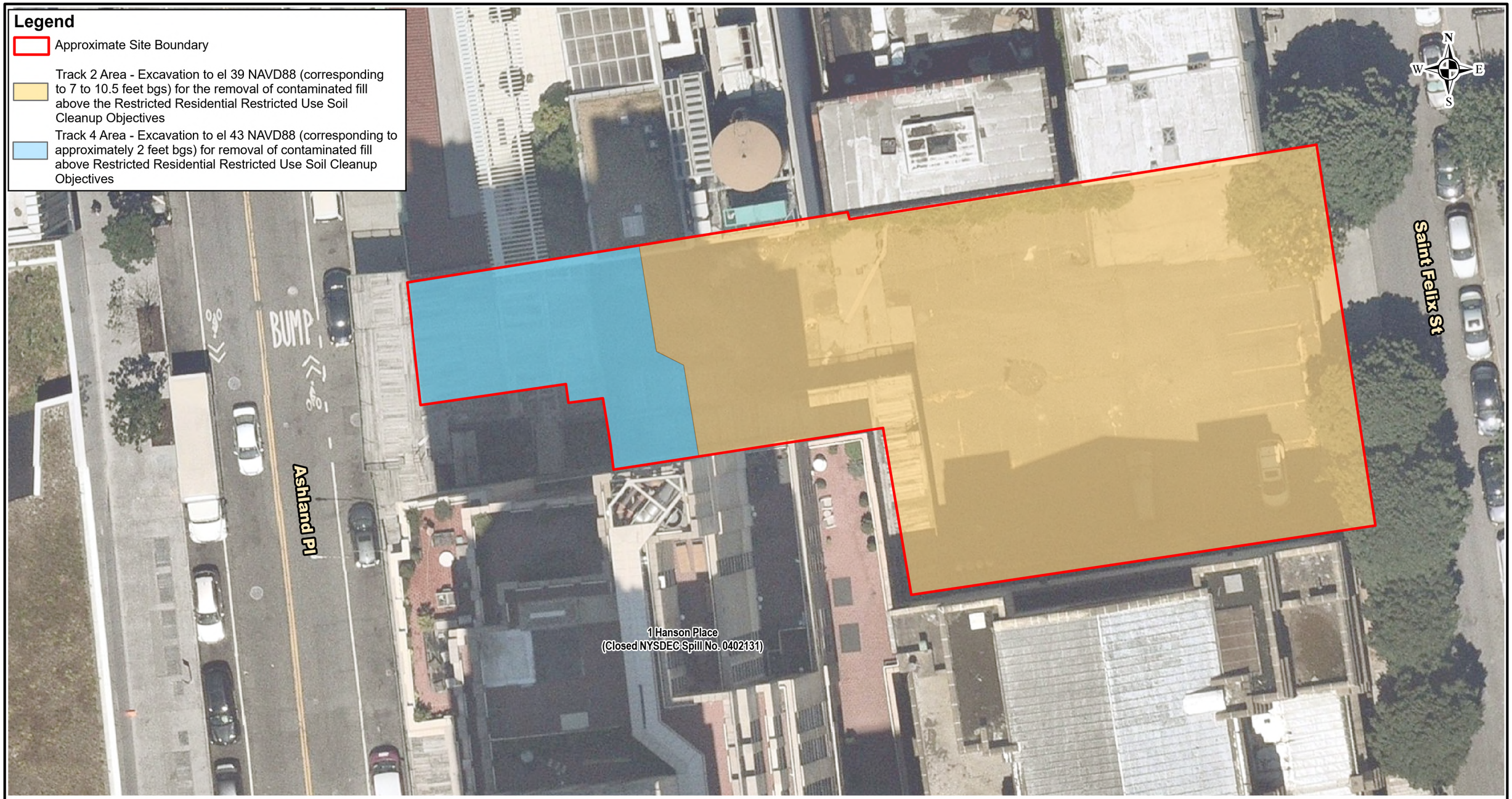

20 0 20
SCALE IN FEET

Notes:
1. Aerial imagery provided through Langan's subscription to Nearmap, dated 19 July 2022.
2. Parcel information from MapPLUTO 18v2 copyrighted by the New York City Department of Planning.
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Project
130 SAINT FELIX STREET
BLOCK No. 2111, Portion of LOT No. 40
BROOKLYN NEW YORK

Drawing Title
ALTERNATIVE II - COMBINED TRACKS 2 AND 4 CLEANUP

Project No.	100842301
Date	7/31/2024
Scale	1" = 20 feet
Drawn By	PDT
Figure	9

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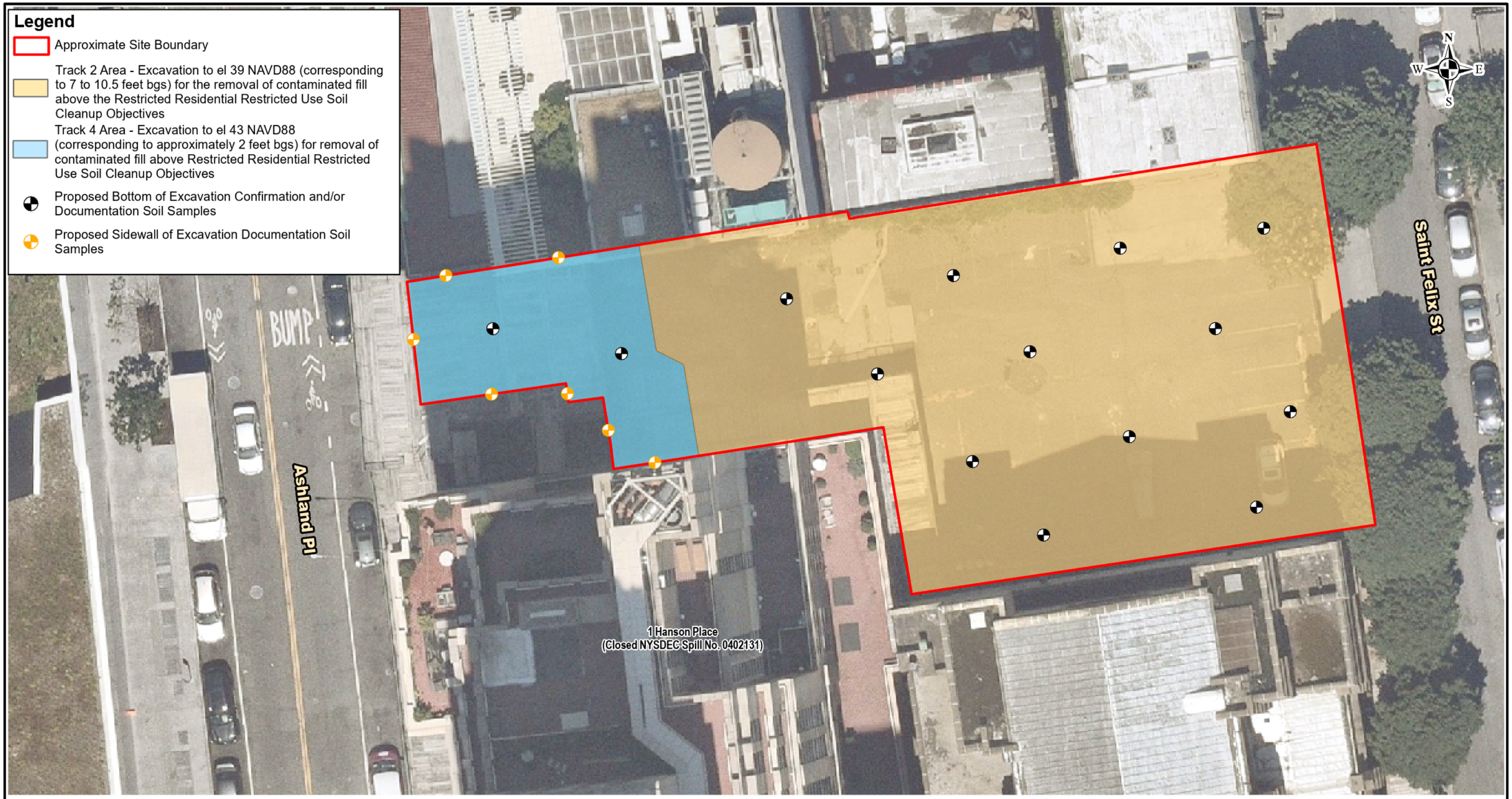

20 0 20
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1. Aerial imagery provided through Langan's subscription to Nearmap, dated 19 July 2022.
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5. Site boundary extents are based on Metes and Bounds Description provided by True North Surveyors, P.C.
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Project
130 SAINT FELIX STREET
BLOCK No. 2111, Portion of LOT No. 40
BROOKLYN NEW YORK

Drawing Title
PROPOSED ENDPOINT CONFIRMATION/ DOCUMENTATION SAMPLING

Project No.	100842301
Date	5/17/2024
Scale	1" = 20 feet
Drawn By	PDT
Figure	10

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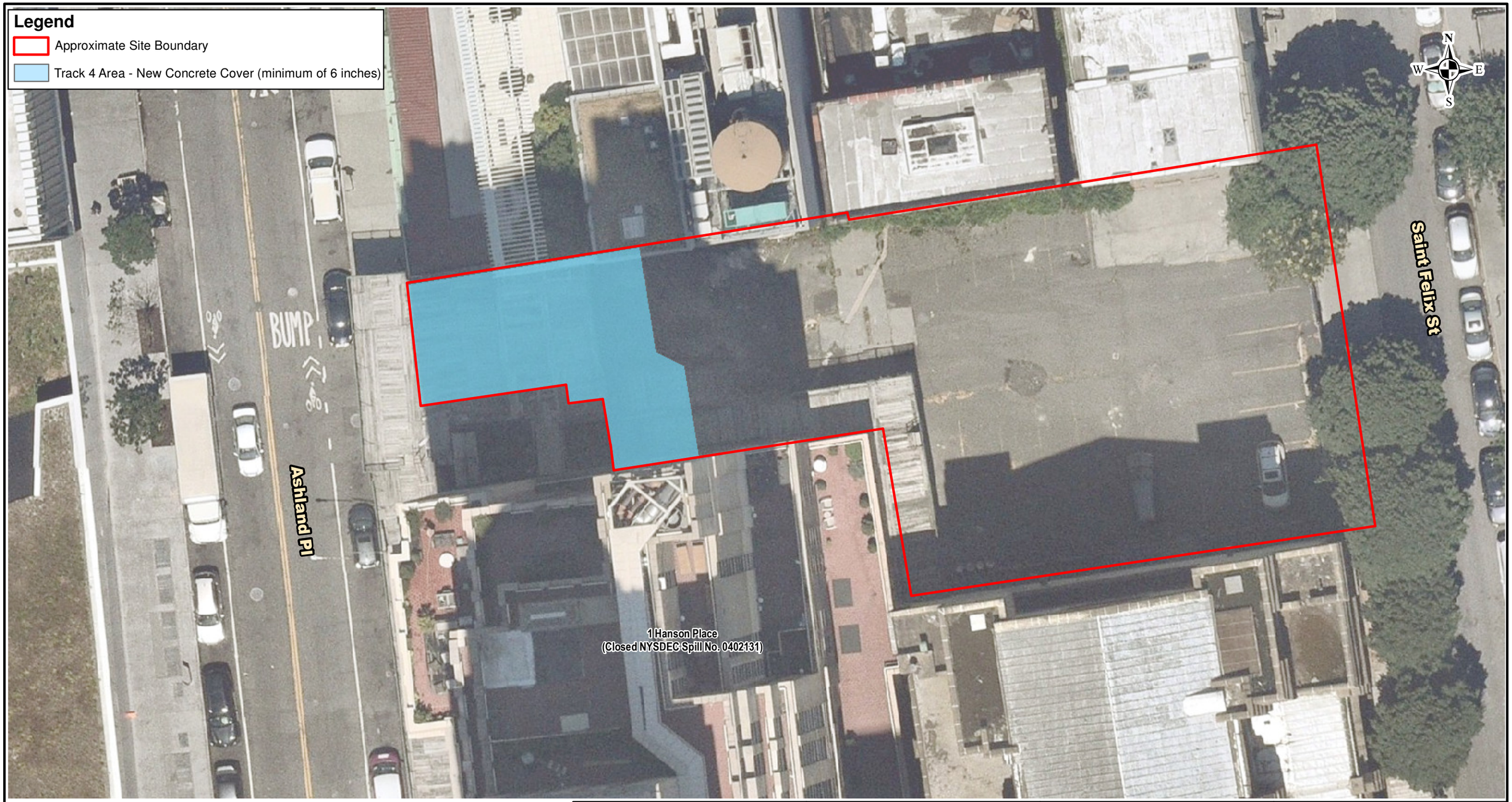

20 0 20
SCALE IN FEET

Notes:
1. Aerial imagery provided through Langan's subscription to Nearmap, dated 19 July 2022.
2. Parcel information from MapPLUTO 18v2 copyrighted by the New York City Department of Planning.
5. Site boundary extents are based on Metes and Bounds Description provided by True North Surveyors, P.C.
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Project
130 SAINT FELIX STREET
BLOCK No. 2111, Portion of LOT No. 40
BROOKLYN NEW YORK

Drawing Title
COMPOSITE COVER SYSTEM

Project No.	100842301
Date	7/31/2024
Scale	1 " = 20 '
Drawn By	IHB
Figure	11

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Path: \\langan.com\data\PAR\data3\100842301\Project Data\ArcGIS\MXD\Environmental_Figures\2024-05\Figure 10 - Composite Cover.mxd Date: 7/31/2024 User: ibaker Time: 11:53:49 AM

Directions

1. Head North on Ashland Place.
2. Turn left onto Fulton Street.
3. Turn right onto Flatbush Avenue/ Manhattan Bridge Upper Roadway.
4. Continue onto Chrystie Street.
5. Turn left onto Broom Street.
6. Turn left onto Watts Street.
7. Take ramp onto I-78/Holland Tunnel.

Notes:
1. World Streets basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online.

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Project	Drawing Title	Project No.	Figure
130 SAINT FELIX STREET BLOCK No. 2111, LOT No. 40 BROOKLYN NEW YORK	TRUCK ROUTE MAP	100842301	12
		Date: 7/31/2024	
		Scale: 1"=2,000'	
		Drawn By: IHB	

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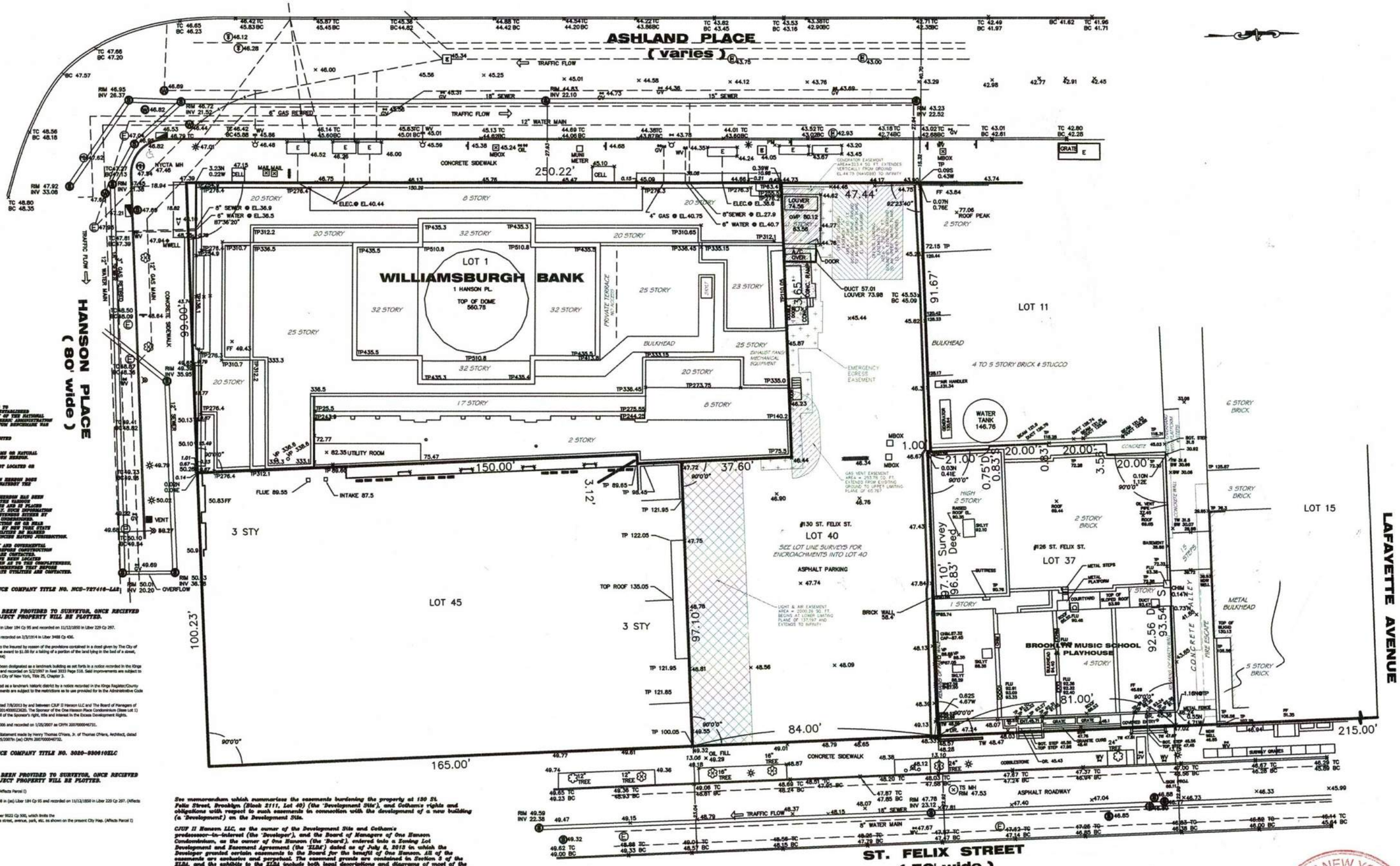
APPENDIX A

Site Survey



AS PER FIRST AMERICAN TITLE INSURANCE COMPANY TITLE NO. NCS-727416-LA81 SCHEDULE B-II EXCEPTIONS:

NOTE AS OF 3-19-21: DESCRIPTIONS LISTED BELOW HAVE NOT BEEN PROVIDED TO SURVEYOR, ONCE RECIEVED ANY EXCEPTIONS THAT AFFECT THE SUBJECT PROPERTY WILL BE PLOTTED.

5. Covenants and restrictions contained in deed recorded on 9/7/1848 in Liber 184 Cp 95 and recorded on 11/12/1850 in Liber 229 Cp 297.

6. Railroad Consents recorded on 11/12/1913 in Liber 3483 Cp 33 and recorded on 3/3/1914 in Liber 3488 Cp 436.

7. Policy will except any loss or damage or diminution of any award to the insured by reason of the provisions contained in a deed given by The City of New York recorded 6/7/1962 in (as) Liber 9022 Cp 500, which limits the award to $1.00 for a taking of a portion of the land lying in the bed of a street, avenue, park, etc. as shown on the present City Map. (Affects Old Lot 44)

8. The Improvements on the premises described in Schedule A have been designated as a landmark building as set forth in a notice recorded in the Kings Register/County Clerk's office on 2/1/1978 in (as) Reel 573 Page 1910 and recorded on 5/2/1997 in Reel 3033 Page 518. Said improvements are subject to the restrictions as to use provided for in the Administrative Code of the City of New York, Title 25, Chapter 3.

9. The premises described in Schedule A is located in an area designated as a landmark historic district by a notice recorded in the Kings Register/County Clerk's office on 4/22/1980 in (as) Reel 1154 Page 1608. Said improvements are subject to the restrictions as to use provided for in the Administrative Code of the City of New York, Title 25, Chapter 3. (See Plat)

10. Burdens contained in Zoning Lot and Development Agreement dated 7/8/2013 by and between CJUF II Hanson LLC and The Board of Managers of One Hanson Place Condominium recorded on 1/17/2014 in (as) CRFN 2014000023620. The Sponsor of the One Hanson Place Condominium (Base Lot 1) hereby grants, conveys, assigns and transfers to the owner of Lot 40 all of the Sponsor's right, title and interest in the Excess Development Rights.

11. FOR INFORMATION ONLY: Certificate of Ownership dated 10/31/2006 and recorded on 1/25/2007 as CRFN 2007000046731.

12. FOR INFORMATION ONLY: Zoning Lot Description and Ownership Statement made by Henry Thomas O'Hara, Jr. of Thomas O'Hara, Architect, dated 1/11/2007 executed by Henry Thomas O'Hara, Jr. and recorded on 1/25/2007in (as) CRFN 2007000046732.

AS PER FIRST AMERICAN TITLE INSURANCE COMPANY TITLE NO. 3020-930010ZLC ITEMS THAT AFFECT TITLE:

NOTE AS OF 3-19-21: DESCRIPTIONS LISTED BELOW HAVE NOT BEEN PROVIDED TO SURVEYOR, ONCE RECIEVED ANY EXCEPTIONS THAT AFFECT THE SUBJECT PROPERTY WILL BE PLOTTED.

1. Tax Lien Certificate No. 34 recorded in (as) CRFN 2018000284201. (Affects Parcel I)

2. Covenants and restrictions contained in deed recorded on 09/07/1848 in (as) Liber 184 Cp 95 and recorded on 11/12/1850 in Liber 229 Cp 297. (Affects Parcel I)

3. Deed given by The City of New York recorded 06/07/1962 in (as) Liber 9022 Cp 500, which limits the award to $1.00 for a taking of a portion of the land lying in the bed of a street, avenue, park, etc. as shown on the present City Map. (Affects Parcel I)

4. Notice(s) of Sidewalk Violation(s):
(a) Filed: 09/26/1966
Index No.: N/A
Block: 2111
Lot: 1 (Base Lot)
(Affects Parcel II)

(b) Filed: 01/25/2016
Index No.: N/A
Block: 2111
Lot: 37 (Parcel III)

5. Declaration of Condominium and By - Laws of the One Hanson Place Condominium dated 04/12/2007, recorded 04/20/2007 in (as) CRFN 2007000206106, as amended by First Amendment to Declaration dated as of 09/26/2007 and recorded 10/22/2007 in (as) CRFN 2007000533743 and further amended by Second Amendment to Declaration dated as of 04/15/2008 and recorded 05/28/2008 in (as) CRFN 2008000214044 and further amended by Third Amendment to Declaration dated 05/21/2011 and recorded 03/14/2012 in (as) CRFN 2012000102863. (Affects Parcel II)

6. Restrictive Covenants as set forth in (as) Liber 184 Cp 95 and Liber 229 Cp 297. (Affects Parcel II)

7. Covenants and Restrictions set forth in a Deed recorded 01/25/1850 in (as) Liber 209 Cp 381. (Affects Parcel II)

8. Subway Consent recorded 02/03/1914 in (as) Liber 3468 Cp 441. (Affects Parcel II)

9. Subway Consent recorded 02/24/1914 in (as) Liber 3472 Cp 375. (Affects Parcel II)

10. Subway Stairway Agreement recorded 11/09/1920 in (as) Liber 4000 Cp 153. (Affects Parcel II)

11. Access Agreement made to the City of New York recorded 05/01/1928 in (as) Liber 4927 Cp 231. (Affects Parcel II)

12. Boundary Line Agreement dated 10/07/1929 and recorded 10/3/1929 in (as) Liber 5077 Cp 386. (Affects Parcel II)

13. Deed given by The City of New York recorded 06/07/1962 in (as) Liber 5077 Cp 386, which limits the award to $1.00 for a taking of a portion of the land lying in the bed of a street, avenue, park, etc. as shown on the present City Map. (Affects Parcel II)

14. The improvements on the premises described in Schedule A have been designated as a landmark building as set forth in a notice recorded in the Register/County Clerk's office on 02/01/1978 and 05/02/1997 in (as) Reel 573 Page 1910 and Reel 3033 Page 518. Said improvements are subject to the restrictions as to use provided for in the Administrative Code of the City of New York, Title 25, Chapter 3. (Affects Parcels I and II)

See memorandum which summarizes the easements burdening the property at 130 St. Felix Street, Brooklyn (Block 2111, Lot 40) (the 'Development Site'), and Gotham's rights and obligations with respect to such easements in connection with the development of a new building (a 'Development') on the Development Site.

CJUF II Hanson LLC, as the owner of the Development Site and Gotham's predecessor-in-interest (the 'Developer'), and the Board of Managers of One Hanson Condominium, as the owner of One Hanson (the 'Board'), entered into a Zoning Lot Development and Easement Agreement (the 'ZLDA') dated as of July 8, 2013 in which the Developer granted certain easements to the Board for the benefit of One Hanson. All of the easements are exclusive and perpetual. The easement grants are contained in Section 2 of the ZLDA, and the exhibits to the ZLDA include both legal descriptions and diagrams of most of the easements, which are attached hereto as Exhibit A (the 'Easement Documents'). In addition, we have prepared an illustrative diagram indicating the general location of all of the easements (the 'Easement Diagram'), which is attached hereto as Exhibit B. The ZLDA provides that several of the easements may be relocated or incorporated into a Development if certain conditions are met, and to client as to others. The list of easements, along with an indication as to whether the ZLDA provides for their relocation and/or incorporation, is as follows:

Easement type	ZLDA provides for relocation based on specified conditions	ZLDA provides for incorporation based on specific conditions
A. Light and Air Easement	No.	No.
B. Off-Site Loading Easement	No.	Yes.
C. Emergency Egress Easement	Yes.	Yes.
D. Gas Vent Easement	Yes.	No.
E. Generators Easement	Yes.	No.
F. Louvers Easement	No.	No. (shown on lot line survey)

The descriptions of some of the easements include lower or upper limiting planes measured in relation to Brooklyn Borough Datum. All elevations shown on survey have been converted to NAVD88.

Flood Map Note:

BY GRAPHIC PLOTTING ONLY, THIS PROPERTY LIES WITHIN ZONE X OF THE FLOOD INSURANCE RATE MAP COMMUNITY PANEL NO. 3604970211F, WHICH BEARS AN EFFECTIVE DATE OF SEPTEMBER 5, 2007. ZONE X IS AN AREA OF MINIMAL FLOOD HAZARD.

REVISIONS	INITIAL	DATE	FIELD CREW: 3-13-21
			FB PG
			SCALE: 1" = 10'
			DRAWN BY: JMV
			CHKD BY: JMV
			COMP FILED: 3-18-21

ARCHITECTURAL SURVEY
SITUATED IN
THE BOROUGH OF BROOKLYN
CITY OF NEW YORK
STATE OF NEW YORK

BLOCK 2111 LOT 1, 37, & 40

I CERTIFY TO: 130 St. Felix St. LLC
THAT THIS SURVEY WAS PREPARED AND REVIEWED UNDER MY SUPERVISION IN THE OFFICE AND THE FIELD.

STATE OF NEW YORK JOHN VIDA 050296 LICENSED PROFESSIONAL SURVEYOR

True North Surveyors, Inc.
141 Montgomery Street, Hoboken NJ 07030
Phone: (201) 534-8248 Fax: (866) 534-4822

John J. Vida Date
John J. Vida N.Y.P.L.S. Lic. No. 050296
PROFESSIONAL LAND SURVEYOR

APPENDIX B

Proposed Development Plans

130 SAINT FELIX

PROJECT NUMBER: 18044.L01

OWNER/DEVELOPER:

130 SAINT FELIX STREET, LLC

432 PARK AVENUE SOUTH, 2ND FLOOR
NEW YORK, NY 10116
212.599.0520

ARCHITECT:

FXCOLLABORATIVE ARCHITECTS, LLP

1 WILLOUGHBY SQUARE, 7TH FLOOR
BROOKLYN, NY 11201
212.627.1700

STRUCTURE:

DESIMONE CONSULTING ENGINEERS

140 BROADWAY, 25TH FLOOR
NEW YORK, NY 10005
212.532.2211

MEPFP:

COSENTINI ASSOCIATES

498 SEVENTH AVENUE
NEW YORK, NY 10018
212.615.3600

VERTICAL TRANSPORTATION:

VDA

145 WEST 30TH STREET, 4TH FLOOR
NEW YORK, NY 10001
212.868.9090

FACADE:

Frank Seta & Associates, LLC

35 WEST 35TH STREET, 8TH FLOOR
NEW YORK, NY 10001
212.465.1600

CIVIL, GEOTECHNICAL:

LANGAN

21 PENN PLAZA, 360 WEST 31ST STREET, 8TH FLOOR
NEW YORK, NY 10001
212.479.5400

CODE:

MILROSE CONSULTANTS

498 SEVENTH AVENUE, 17TH FLOOR
NEW YORK, NY 10018
212.643.4545

ACCESSIBILITY:

United Spinal Association Accessibility Services

120-34 Queens Boulevard #320
Kew Gardens, NY 11415
718.803.3782, ext. 7502

ACOUSTICS:

Shen Milsom & Wilke, LLC

417 FIFTH AVENUE
NEW YORK, NY 10016
212.725.6800

Sheet Number	Sheet Name	SD
A-000	COVER SHEET AND DRAWING LIST	■
A-002	ABBREVIATIONS, MATERIALS, AND SYMBOLS	■
A-003	SITE PLAN	■
A-004	EXISTING SITE SURVEY	■
A-005	MINIMUM ACCESSIBILITY REQUIREMENTS	■
A-006	MINIMUM ACCESSIBILITY REQUIREMENTS	■
A-007	MINIMUM ACCESSIBILITY REQUIREMENTS	■
A-008	PARTITION TYPES	■
A-100	CELLAR FLOOR PLAN	■
A-101	GROUND FLOOR PLAN	■
A-102	2ND FLOOR PLAN	■
A-103	3RD FLOOR PLAN	■
A-104	4TH-5TH FLOOR PLAN	■
A-106	6TH FLOOR PLAN	■
A-107	7TH-13TH FLOOR PLAN	■
A-114	14TH-16TH FLOOR PLAN	■
A-117	17TH-19TH FLOOR PLAN	■
A-120	20TH-22ND FLOOR PLAN	■
A-123	23RD FLOOR PLAN	■
A-124	BULKHEAD ROOF PLAN	■
A-125	BULKHEAD EMR PLAN	■
A-400	EXTERIOR RENDERINGS	■
A-402	BUILDING ELEVATIONS – EAST AND NORTH	■
A-403	BUILDING ELEVATIONS – WEST AND SOUTH	■
A-404	OVERALL BUILDING SECTIONS	■
A-510	TYPICAL FACADE TYPES AND WALL SECTIONS	■
A-511	TYPICAL FACADE TYPES AND WALL SECTIONS	■
A-550	PENTHOUSE AND BULKHEAD ELEVATION AND SECTION	■
A-570	SAINT FELIX STREET RESIDENTIAL ENTRANCE ELEVATION AND SECTION	■
A-571	ASHLAND PLACE SERVICE ENTRANCE ELEVATION AND SECTION	■
C-200	CIVIL SITE PLAN	■
FO-101	FOUNDATION/CELLAR FRAMING PLAN	■
FO-110	OVERALL PLAN VIEW	■
FO-111	TA SECTION	■
S-001	GENERAL NOTES	■
S-002	CONCRETE STRENGTHS AND QUANTITIES	■
S-003	NYC TRANSIT GENERAL NOTES	■
S-004	NYC TRANSIT INSURANCE REQUIREMENTS	■
S-201	GROUND FLOOR FRAMING PLAN	■
S-202	2ND FLOOR FRAMING PLAN	■
S-203	3RD FLOOR FRAMING PLAN	■
S-204	4TH-5TH FLOOR FRAMING PLAN	■
S-206	6TH FLOOR FRAMING PLAN	■
S-207	7TH-13TH FLOOR FRAMING PLAN	■
S-214	14TH-16TH FLOOR FRAMING PLAN	■
S-217	17TH FLOOR FRAMING PLAN	■
S-218	18TH-19TH FLOOR FRAMING PLAN	■
S-220	20TH-22ND FLOOR FRAMING PLAN	■
S-223	23RD FLOOR FRAMING PLAN	■
S-224	24TH FLOOR FRAMING PLAN	■
S-225	25TH-26TH FLOOR FRAMING PLAN	■
S-302	BUILDING ELEVATION	■

Sheet Number	Sheet Name	SD
M-001	MECHANICAL NOTES, SYMBOLS, & ABBREVIATIONS	■
M-100	MECHANICAL CELLAR FLOOR PLAN	■
M-101	MECHANICAL GROUND FLOOR PLAN	■
M-102	MECHANICAL 2ND FLOOR PLAN	■
M-103	MECHANICAL 3RD FLOOR PLAN	■
M-104	MECHANICAL 4TH - 5TH FLOOR PLAN	■
M-106	MECHANICAL 6TH FLOOR PLAN	■
M-107	MECHANICAL 7TH - 13TH FLOOR PLAN	■
M-114	MECHANICAL 14TH - 16TH FLOOR PLAN	■
M-117	MECHANICAL 17TH - 19TH FLOOR PLAN	■
M-120	MECHANICAL 20TH - 21ST FLOOR PLAN	■
M-124	MECHANICAL BULKHEAD FLOOR PLAN	■
M-125	MECHANICAL BULKHEAD FLOOR PLAN	■
M-301	MECHANICAL AIR RISER DIAGRAM SHEET 1	■
M-302	MECHANICAL AIR RISER DIAGRAM SHEET 2	■
E-100	ELECTRICAL CELLAR FLOOR PLAN	■
E-124	ELECTRICAL BULKHEAD FLOOR PLAN	■
E-125	ELECTRICAL BULKHEAD EMR FLOOR PLAN	■
E-301	ELECTRICAL RISER DIAGRAM	■
P-100	CELLAR PLUMBING PLAN	■
P-107	PLUMBING 7TH - 13TH FLOOR PLAN	■
P-300	PLUMBING DOMESTIC WATER RISER DIAGRAM	■
P-310	PLUMBING SANITARY RISER DIAGRAM	■
P-320	PLUMBING GAS RISER DIAGRAM	■
P-330	PLUMBING STORM RISER DIAGRAM	■
FP-300	FIRE PROTECTION RISER DIAGRAM	■

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	REVISIONS | SUBMISSIONS	DATE
	SCHEMATIC DESIGN	03.02.2022

fxcollaborative

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FRANK SETA & ASSOCIATES, LLC
35 West 35th Street, 8th Floor, New York, NY 10001 212-465-1600
VDA
145 West 30th Street, 4th Floor, New York, NY 10001 212-868-9090
LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York, NY 10001 212-479-5400

130 SAINT FELIX
BROOKLYN MUSIC SCHOOL
130 Saint Felix Street, Brooklyn, NY 11217

DRAWING TITLE:
COVER SHEET AND DRAWING LIST

Seal:

Drawn: Author
Checked: Checker
Reviewed:
Date: 02/15/22
Scale:

Project No.: 18044.L01
Drawing No.: A-000.00

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3/3/2022 7:44:02 PM

#	NUMBER OR POUND
&	AND
@	AT
A/V	AUDIO/VISUAL
AB	AIR BARRIER
ABBRV	ABBREVIATION
AC	AIR CONDITIONING
ACC	ACCESSIBLE
ACCS	ACCESSORY OR ACCESSORIES
ACL	ADJUSTED CURB LEVEL
ACS FLR	ACCESS FLOOR
ACST	ACOUSTIC OR ACOUSTICAL
ACT	ACOUSTICAL CEILING TILE
AD	ACCESS DOOR
AD	AREA DRAIN
ADA	AMERICANS WITH DISABILITIES ACT
ADC	AUTOMATIC DOOR CLOSER
ADDL	ADDITIONAL
ADJ	ADJUSTABLE
ADMIN	ADMINISTRATION
AFF	ABOVE FINISH(ED) FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
ALNMT	ALIGNMENT
ALT	ALTERNATE
ALUM	ALUMINUM
ANOD	ANODIZED
ANT	ANTENNA
AP, ACS PNL	ACCESS PANEL
APC	ACOUSTICAL PANEL CEILING
APPD	APPROVED
APPROX	APPROXIMATE
APT	APARTMENT
ARCH	ARCHITECT OR ARCHITECTURAL
ARCS	AUXILIARY RADIO COMMUNICATION SYSTEM
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS
ASPH	ASPHALT
ASSY	ASSEMBLY
ASYM	ASYMMETRICAL
AT	AIR TERMINAL (LIGHTNING PROTECTION SYSTEM)
ATC	AIR TERMINAL – CUSTOM (LIGHTNING PROTECTION SYSTEM)
ATCH	ATTACH OR ATTACHMENT
ATS	AUTOMATIC TRANSFER SWITCH(ES)
AUTO	AUTOMATIC
AUX	AUXILIARY
AVB	AIR VAPOR BARRIER
AVE	AVENUE
AVG	AVERAGE
BALC	BALCONY
BC	BUILDING CODE
BDRY	BOUNDARY
BET.	BETWEEN
BFE	BASE FLOOD ELEVATION
BITUMN	BITUMINOUS
BKGD	BACKGROUND
BL, ℄	BUILDING LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BLKHD	BULKHEAD
BLKT	BLANKET (INSULATION)
BLR	BOILER
BLVD	BOULEVARD
BLW	BELOW
BM	BEAM
BMS	BUILDING MANAGEMENT SYSTEM
BMU	BUILDING MAINTENANCE UNIT
BO	BOTTOM OF
BOH	BACK OF HOUSE
BOT	BOTTOM
BR	BEDROOM
BR	BATHROOM

BRCG	BRACING
BRDG	BRIDGING
BRG	BEARING
BRK	BRICK MASONRY
BRKT	BRACKET
BRZ	BRONZE
BSMT	BASEMENT
BT	BATHTUB
BTWN	BETWEEN
BUR	BUILT-UP ROOF OR ROOFING
BYND	BEYOND
CAB	CABINET
CALC	CALCULATE
CANT	CANTILEVER
CATW	CATWALK
CCTV	CLOSED CIRCUIT TELEVISION SYSTEM
CD	CONSTRUCTION DOCUMENTS
CE	COMBINATION (PASSENGER / SERVICE) ELEVATOR
CEM.	CEMENT
CER.	CERAMIC
CERT	CERTIFICATION
CFLG	COUNTER FLASHING
CFMF	COLD-FORMED METAL FRAMING
CHNL	CHANNEL
CHR PL	CHROME PLATED
CIP	CAST-IN-PLACE
CJ, CONT JT	CONTROL JOINT
CL, ℄	CENTER LINE
CLASS	CLASSIFICATION
CLDG	CLADDING
CLG	CEILING
CLL	CONTRACT LIMIT LINE
CLR	CLEAR
CLR	COLOR
CLT	CLOSET
CM	CONSTRUCTION MANAGER
CMPST	COMPOSITE
CMU	CONCRETE MASONRY UNIT
CNCL	CONCEALED
CND	CONDUIT
CNPY	CANOPY
CNR	CORNER
CO	CLEANOUT
COL	COLUMN
COMB	COMBINATION OR COMBINED
COMM	COMMUNICATIONS
COMML	COMMERCIAL
COMP	COMPONENT
COMPT	COMPARTMENT
CON ED	CONSOLIDATED EDISON COMPANY OF NEW YORK
CONC	CONCRETE
COND.	CONDUIT
CONSTR	CONSTRUCTION
CONT	CONTINUOS
CONV	CONVECTOR
COORD	COORDINATE (POINT)
CORR	CORRIDOR
CPC	CITY PLANNING COMMISSION
CPRS	COMPRESSIBLE
CRT YD	COURTYARD
CSB	CONCRETE SPLASH BLOCK
CSK	COUNTER SUNK
CSMT	CASEMENT
CSWK	CASEWORK
CTG	COATING
CTR	CENTER
CUH	CABINET UNIT HEATER
CW	CURTAIN WALL (ASSEMBLY)
D	DEEP OR DEPTH
DAS	DISTRIBUTED ANTENNA SYSTEM
DEDUCT	DEDUCTION
DEG	DEGREE
DEMO	DEMOLISH OR DEMOLITION
DEPT	DEPARTMENT
DF	DRINKING FOUNTAIN

DFE	DESIGN FLOOD ELEVATION
DIA	DIAMETER
DIAG	DIAGONAL
DIFF	DIFFUSER
DIM(S)	DIMENSION(S)
DIST	DISTANCE
DLO	DAYLIGHT OPENING
DMPF	DAMPPROOFING
DMR	DIMMER
DMR SW	DIMMER SWITCH
DN	DOWN
DOAS	DEDICATED OUTSIDE AIR SUPPLY (UNIT)
DOB	DEPARTMENT OF BUILDINGS
DR	DINING ROOM
DR	DOOR
DR	DRAIN
DSGN	DESIGN
DTL	DETAIL
DUPL	DUPLICATE
DW	DISHWASHER
DWG	DRAWING
DWR	DRAWER
EA	EACH
EIFS	EXTERIOR INSULATION AND FINISH SYSTEM
EJ, EXP JT	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC
ELEC CLT	ELECTRIC CLOSET
ELEV	ELEVATOR
EMER	EMERGENCY
EMI	ELECTROMAGNETIC INTERFRERENCE
EMR	ELEVATOR MACHINE ROOM
EMS	ELEVATOR MANAGEMENT SYSTEM
EN	ENERGY (CONSERVATION CODE DRAWINGS)
ENCL	ENCLOSURE
ENG	ENGINEER
ENTR	ENTRANCE
EOS	EDGE OF SLAB
EPDM	ETHYLENE PROPYLENE DIENE TERPOLYMER (ROOFING)
EPS	EXPANDED POLYSTYRENE BOARD (INSULATION)
EQ	EQUAL
EQL SP	EQUALLY SPACED
EQUIP	EQUIPMENT
ESC	ESCUTCHEON
ESCAL	ESCALATOR
ESMT	EASEMENT
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
EXTRU	EXTRUSION
FA	FIRE ALARM
FA	FRESH AIR
FAI	FRESH AIR INLET OR INTAKE
FAR	FLOOR AREA RATIO
FCC	FIRE COMMAND CENTER
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FDNY	FIRE DEPARTMENT (OF THE CITY OF) NEW YORK
FDTN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF	FINISH OR FINISHED FLOOR
FF	FINISH FACE
FFE	FURNITURE, FIXTURES AND EQUIPMENT
FGL	FIBERGLASS
FHC	FIRE HOSE CABINET
FIN	FINISH(ED)
FIN FLR	FINISH FLOOR
FIRM	FLOOD INSURANCE RATE MAP
FIXT	FIXTURE
FLEX	FLEXIBLE
FLMT	FLUSH MOUNT OR MOUNTED

FLR	FLOOR
FM	FAÇADE MAINTENANCE
FO	FACE OF
FO	FINISH OR FINISHED OPENING
FOW	FACE OF WALL
FP	FIREPROOF OR FIREPROOFING
FP	FIRE PROTECTION (SUPPRESSION)
FPSC	FIREPROOF SELF CLOSING
FR	FIRE RETARDANT
FR	FIRE RESISTANT OR FIRE-RESISTANCE RATING
FR GL	FRITTED GLASS
FRMG	FRAMING
FRT	FREIGHT
FRTW	FIRE RETARDANT TREATED WOOD
FRZ	FREEZER
FSAE	FIRE SERVICE ACCESS ELEVATOR
FSP	FIRE STANDPIPE
FSTNR	FASTENER
FT	FOOT OR FEET
FTG	FOOTING
FTR	FIN TUBE RADIATION OR RADIATOR
FURN	FURNISH
FURN	FURNITURE
GA	GAUGE
GALV	GALVANIZED
GALV STL	GALVANIZED STEEL
GB	GRAB BAR
GC	GENERAL CONTRACTOR
GDR	GUARDRAIL
GEN	GENERATOR
GF	GROUND FLOOR
GFA	GROSS FLOOR AREA
GFI	GROUND FAULT INTERRUPT (CIRCUIT)
GFRC	GLASS-FIBER-REINFORCED CONCRETE
GFRG	GLASS-FIBER-REINFORCED GYPSUM
GFRP	GLASS-FIBER-REINFORCED POLYMER
GL	GLASS
GRD	GROUND
GRDN	GARDEN
GRL	GRILLE
GROM	GROMMET
GRP	GROUP
GRTG	GRATING
GSF	GROSS SQUARE FEET
GWB	GYPSUM WALL BOARD
GYM	GYMNASIUM
GYP.BD	GYPSUM BOARD
H	HIGH
HB	HOSE BIBB
HC	HANDICAPPED
HM	HOLLOW METAL
HNDRL	HANDRAIL
HORIZ	HORIZONTAL
HP	HIGH POINT
HR	HOUR(S)
HR	HIGH-RISE
HS	HEAT-STRENGTHENED (GLASS)
HSKPG	HOUSEKEEPING
HSS	HOLLOW STRUCTURAL SECTION
HT	HEIGHT
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
HW	HOT WATER
HWY	HIGHWAY
HYD	HYDRANT
HYDR	HYDRAULIC
ID	INSIDE DIAMETER OR DIMENSION
IDF	INTERMEDIATE DISTRIBUTION FRAME
IF	INSIDE FACE
IFRM	INTUMESCENT FIRE RESISTIVE MATERIAL
IGU	INSULATED GLASS UNIT
ILLUM	ILLUMINATION
ILO	IN LIEU OF
IN	INCH
INCL	INCLUDE OR INCLUDED

INSUL	INSULATED OR INSULATION
INT	INTERIOR
INT	INTERMEDIATE
IR	INSIDE RADIUS
IRMA	INVERTED ROOF MEMBRANE ASSEMBLY
IT	INFORMATION TECHNOLOGY
J-BOX	JUNCTION BOX
JC	JANITOR'S CLOSET
JCT	JUNCTION
JT	JOINT
KD	KNOCK-DOWN
KE	KITCHEN EXHAUST
KIT	KITCHEN
KO	KNOCKOUT
LA	LANDSCAPE ARCHITECTURE
LAB	LABORATORY
LAD	LADDER
LAM	LAMINATE OR LAMINATED
LAM GL	LAMINATED GLASS
LATL	LATERAL
LAV	LAVATORY
LBL	LABEL
LCD	LIQUID CRYSTAL DSPLAY
LD	LINEAR DIFFUSER
LDG	LANDING
LDMK	LANDMARK
LDR	LEADER
LED	LIGHT EMITTING DIODE
LF	LINEAR FEET
LIB	LIBRARY
LKR	LOCKER
LKR RM	LOCKER RM
LOCS.	LOCATIONS
LP	LOW POINT
LPC	LANDMARKS PRESERVATION COMMISSION
LPS	LIGHTNING PROTECTION SYSTEM
LR	LIVING ROOM
LR	LOW-RISE
LS	LIFE SAFETY (DRAWINGS)
LSD	LIFE SAFETY DAMPER
LT	LIGHT
LT GA	LIGHT GAUGE
LT WT	LIGHT WEIGHT
LTG	LIGHTING
LTNG	LIGHTNING
LVR	LOUVER
LVR	LOUVER
MACH	MACHINE
MAINT	MAINTENANCE
MATL	MATERIAL
MAX	MAXIMUM
MBR	MASTER BEDROOM
MDF	MAIN DISTRIBUTION FRAME
MDF	MEDIUM DENSITY FIBERBOARD
MECH	MECHANICAL
MED	MEDIUM
MEMB	MEMBRANE
MER	MECHANICAL EQUIPMENT ROOM
MEZZ	MEZZANINE
MF	METAL FURRING
MFR	MANUFACTURER
MGMT	MANAGEMENT
MH	MANHOLE
MIN	MINIMUM
MIRR	MIRROR OR MIRRORED
MISC	MISCELLANEOUS
MISC STL	MISCELLANEOUS STEEL (FRAMING)
MO	MASONRY OPENING
MOD	MODULE
MOD BIT	MODIFIED BITUMEN
MR	MID-RISE
MRT	MARBLE THRESHOLD
MS	MARBLE SADDLE
MT	METAL THRESHOLD
MTA	METROPOLITAN TRANSPORTATION AUTHORITY

MTD	MOUNTED
MTG	MEETING
MTL	METAL
MTLS	METAL SADDLE
MULL	MULLION
MULT	MULTIPLE
MVBL	MOVABLE
MW	MICROWAVE
NA	NOT APPLICABLE
NAT	NATURAL
NATL	NATIONAL
NAVD 88	NORTH AMERICAN VERTICAL DATUM OF 1988
NEG	NEGATIVE
NFA	NET FREE AREA
NFWH	NON-FREEZE WALL HYDRANT
NI SIL	NICKEL SILVER
NIC	NOT IN CONTRACT
NKL	NICKEL
NO	NUMBER
NOM	NOMINAL
NR	NON-RATED
NR	NOISE REDUCTION
NRC	NOISE REDUCTION COEFFICIENT
NSF	NET SQUARE FEET
NTS	NOT TO SCALE
NYC	NEW YORK CITY
NYCBC	NEW YORK CITY BUILDING CODE
NYCCC	NEW YORK CITY CONSTRUCTION CODES
NYCT	NEW YORK CITY TRANSIT (AUTHORITY)
OA	OUTSIDE AIR
OA	OVERALL
OAI	OUTSIDE AIR INTAKE
OC	ON CENTER
OCC	OCCUPY, OCCUPANCY OR OCCUPANTS
OD	OUTSIDE DIAMETER
OD	OVERFLOW (ROOF) DRAIN
OF/CI	OWNER FURNISHED / CONTRACTOR INSTALLED
OF/OI	OWNER FURNISHED / OWNER INSTALLED
OFD	OVERFLOW DRAIN
OFF	OFFICE
OG, OCC GRP	(BUILDING CODE) OCCUPANCY GROUP
OH DR	OVERHEAD (COILING) DOOR
OPNG	OPENING
OPP	OPPOSITE (OR OPPOSITE HAND)
OPR	OPERABLE
OPT	OPTIONAL
OR	OUTSIDE RADIUS
ORN	ORNAMENTAL
OSB	ORIENTED-STRAND BOARD
OSHA	OCCUPANCY SAFETY AND HEALTH ADMINISTRATION
OVFL	OVERFLOW
OVHD	OVERHEAD
PAR	PARALLEL
PART	PARTIAL
PASS	PASSENGER
PAT	PATTERN
PC	POWDER COAT
PCC	PRECAST CONCRETE
PCT	PERCENT
PD	PAVEMENT DRAIN
PE	PASSENGER ELEVATOR
PED	PEDESTAL
PEND	PENDANT
PERF	PERFORATED
PERIM	PERIMETER
PERM	PERMANENT
PERP	PERPENDICULAR
PH	PAPER HOLDER
PH	PENTHOUSE
PH	PHASE
PK GAR	PARKING GARAGE
PL	PLATE

PL, ℄	PROPERTY LINE
PLAM	PLASTIC LAMINATE
PLAT	PLATFORM
PLBG	PLUMBING
PLYWD	PLYWOOD
PMMA	POLYMETHYL METHACRYLATE (ROOFING)
PNL	PANEL
PNT FIN	(SHOP APPLIED) PAINT FINISH
PNTN	PENETRATION
POE	POINT OF ENTRY
POL	POLISHED
POLYISO	POLYISOBUTYLENE BOARD (INSULATION)
POP	POINT OF PRESENCE
PORT	PORTABLE
PREFAB	PREFABRICATE OR PREFABRICATED
PRKG	PARKING
PROJ	PROJECT
PROP	PROPERTY
PSF	POUND PER SQUARE FOOT
PSL	PIPE SLEEVE
PT	PRESSURE TREATED
PTD	PAINTED (ON-SITE)
PTN	PARTITION
PWR	POWER
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R	RISER
R-__	R-VALUE (THERMAL RESISTANCE VALUE)
RA	RETURN AIR
RAD	RADIUS
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
RD	ROAD
RE	RETAIL ELEVATOR
RECPT	RECEPTACLE
REF	REFERENCE
REFR	REFRIGERATOR
REG	REGULATION(S)
REINF	REINFORCED OR REINFORCEMENT
REQ	REQUIRE OR REQUIRED
REQ'D	REQUIRED
RESID	RESIDENTIAL
RESIL	RESILIENT
REST	RESTROOM
RET	RETURN
REV	REVISION
REVL	REVOLVING
RFG	ROOFING
RL	ROOF LEADER
RLG	RAILING
RM	ROOM
RND	ROUND
RO	ROUGH OPENING
RR	RETURN REGISTER
RS	RUBBER SADDLE
RT	ROOF TYPE
RTG	RATING
RTL	RETAIL
SA	SUPPLY AIR
SAFB	SOUND ATTENUATION FIBER BLANKET
SAN	SANITARY
SBSTR	SUBSTRATE
SCH	SCHOOL
SCHED	SCHEDULE
SCHEM	SCHEMATIC
SDBL	SANDBLAST OR SANDBLASTED
SDG	SIDING
SDL	SADDLE
SE	SERVICE ELEVATOR
SEC	SECURITY
SEC.	SECONDARY
SECT	SECTION
SERV	SERVICE
SF, SQ FT	SQUARE FOOT (FEET)
SFRM	SPRAY-APPLIED FIRE-RESISTIVE MATERIAL

SGL	SINGLE
SH.	SHOWER
SHGC	SOLAR HEAT GAIN COEFFICIENT
SHR	SHOWER
SHT	SHEET
SHT MTL	SHEET METAL
SHTHG	SHEATHING
SIM	SIMILAR
SKLT	SKYLIGHT
SLDG	SLIDING
SLNT	SEALANT
SLV	SLEEVE
SND	SANITARY NAPKIN DISPENSER
SO	SLAB OPENING
SP	STARTING POINT
SP	SUMP PIT
SPCL	SPECIAL
SPEC	SPECIFIED OR SPECIFICATION(S)
SPKLR	SPRINKLER
SPKR	SPEAKER
SPRT	SUPPORT
SQ	SQUARE
SQ IN	SQUARE INCH
SQ YD	SQUARE YARD
SR	SUPPLY RISER
SS, ST STL	STAINLESS STEEL
SSF	SOLID SURFACING (MATERIAL)
ST	STREET
STC	SOUND TRANSMISSION CLASS OR COEFFICIENT
STD	STANDARD
STIF	STIFFENER
STL	STEEL
STN	STONE
STOR	STORAGE
STR	STAIR
STRM	STOREROOM
STRT	STRAIGHT
STRUCT	STRUCTURAL
STRUCT STL	STRUCTURAL STEEL
SUB	SUBSTITUTE
SUB FL	SUBFLOOR
SUPPL	SUPPLEMENT
SURF	SURFACE
SUSP	SUSPEND OR SUSPENDED
SUSP CLG	SUSPENDED CEILING
SVCE	SERVICE
SW	SHEAR WALL
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SWR	SEWER
SYM	SYMBOL
SYMM	SYMMETRICAL
SYS	SYSTEM
T	TREAD
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
T/D	TELEPHONE / DATA
TA, TLT ACC'S	TOILET ACCESSORY
TAN	TANGENT
TBD	TO BE DETERMINED
TCF	TOP OF CONCRETE FILL
TD	TOWEL DISPENSER
TD	TRENCH DRAIN
TE	TOILET EXHAUST
TEL	TELEPHONE
TEMP	TEMPORARY
TEXT	TEXTURED
TFF	TOP OF FINISH(ED) FLOOR
THK	THICKNESS
THRES	THRESHOLD
THRU	THROUGH
THRUOUT	THROUGHOUT
TLT	TOILET
TLT PTN	TOILET PARTITION

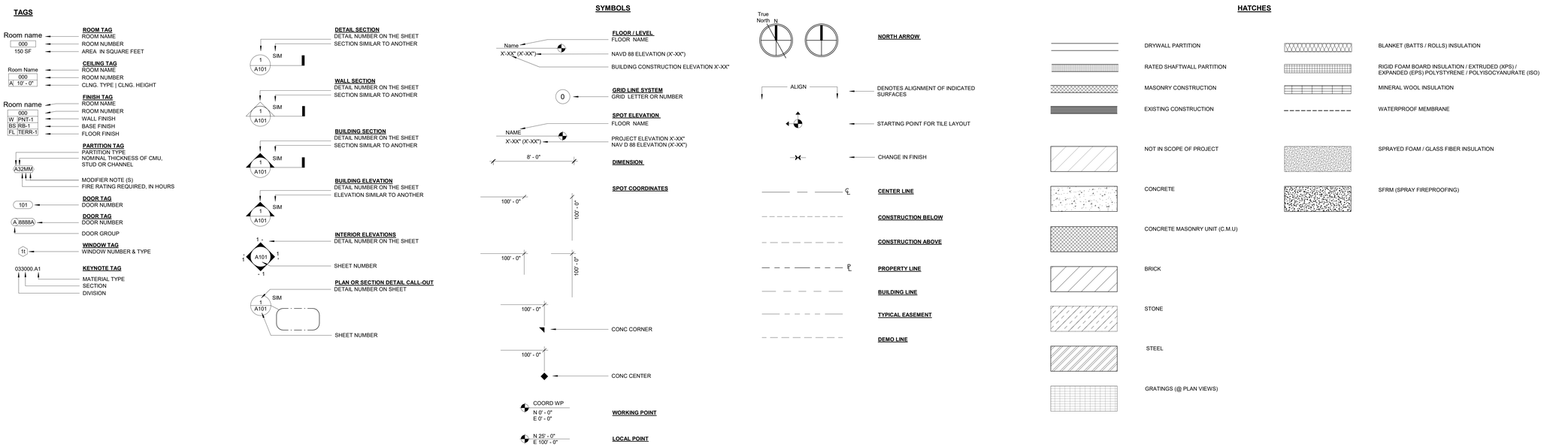
TME	TO MATCH EXISTING
TMPD	TEMPERED
TO	TOP OF
TO STL	TOP OF STEEL (FRAMING)
TOC	TOP OF CURB
TOCF	TOP OF CONCRETE FILL
TOD	TOP OF (METAL) DECK
TOP	TOP OF (EXTERIOR) PAVING
TOP	TOP OF PARAPET
TOS	TOP OF SLAB
TOW	TOP OF WALL
TRANS	TRANSPARENT
TRTD	TREATED
TSER	TELECOMMUNICATIONS SERVICE ENTRANCE ROOM
TV	TELEVISION
TYP	TYPICAL
U	U-FACTOR (HEAT TRANSFER COEFFICIENT)
U/S	UNDERSIDE
UC	UNDER COUNTER
UFAD	UNDERFLOOR AIR-DISTRIBUTION SYSTEM
UG	(ZONING) USE GROUP
UGND	UNDERGROUND
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORIES
UNEX	UNEXCAVATED
UNO	UNLESS NOTED OTHERWISE
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERUPTIBLE POWER SUPPLY
UR	URINAL
USS	UNITED STATES STANDARD
UTIL	UTILITY
UV	ULTRAVIOLET
VAN	VANITY
VAR	VARIES OR VARIATION
VAV	VARIABLE AIR VOLUME
VEH	VEHICLE
VENT	VENTILATION OR (WINDOW) VENTILATOR
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VLT	VISIBLE LIGHT TRANSMISSION
VR	VAPOR RETARDER
VRF	VARIABLE REFRIGERANT FLOW
W	WIDE OR WIDTH
W/	WITH
W/D	WASHER AND DRYER
W/O	WITHOUT
WC	WATER CLOSET
WD	WOOD
WDW	WINDOW
WDW WALL	WINDOW WALL (ENCLOSURE ASSEMBLY)
WIC	WALK-IN CLOSET
WO	WHERE OCCURS
WP	WATERPROOF OR WATERPROOFING
WP	WORKING POINT
WR	WATER RESISTANT
WRB	WEATHER RESISTIVE BARRIER
WSCT	WAINSCOT
WSL	WEATHER SEAL
WT	WALL TYPE
WT	WEIGHT
WTR	WATER
WTR HTR	WATER HEATER
WW	WINDOW WALL
WWM	WELDED WIRE MESH
X BRACE	CROSS BRACE OR BRACING
XFMR	TRANSFORMER
XL	EXTRA LARGE
XPS	EXTRUDED POLYSTYRENE BOARD (INSULATION)
YD	YARD
Z	ZONING (RESOLUTION DRAWINGS)
ZR	ZONING RESOLUTION
±	PLUS / MINUS

S1 ABBREVIATIONS

NTS

M1 MATERIALS AND SYMBOLS

NTS



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NO.	REVISIONS | SUBMISSIONS	DATE
	SCHEMATIC DESIGN	03.02.2022

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LANGAN
21 Penn Plaza, 360 West 31st Street, 8th Floor, New York, NY 10001 212-479-5400

130 SAINT FELIX
BROOKLYN MUSIC SCHOOL
130 Saint Felix Street, Brooklyn, NY 11217

DRAWING TITLE:
ABBREVIATIONS, MATERIALS & SYMBOLS

Seal:

Drawn:

Checked:

Reviewed:

Date: 02/08/2022

Scale: 1/4" = 1'-0"

Project No.: 18044.L01

Drawing No.: A-002.00

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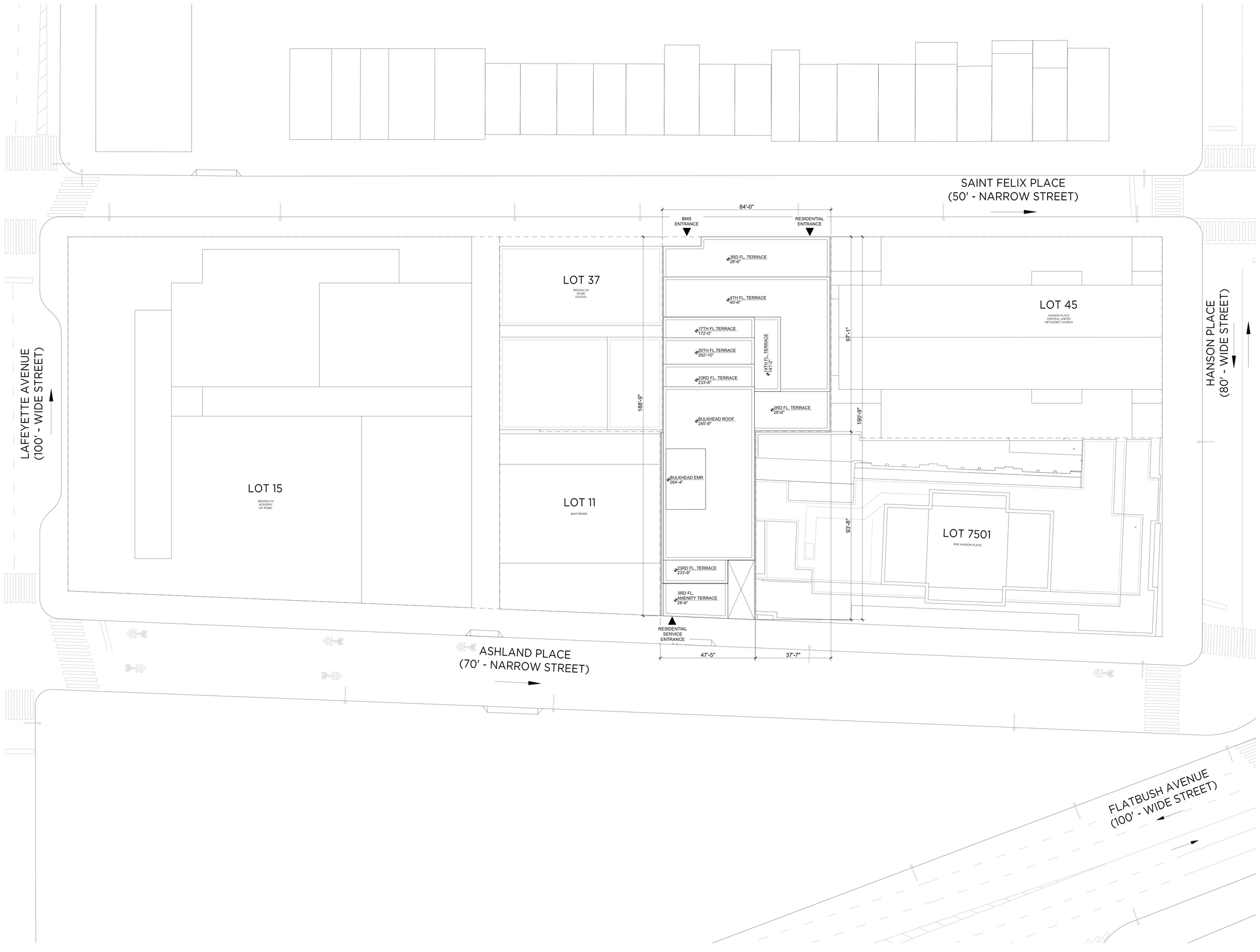

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130 Saint Felix Street, Brooklyn, NY 11217

DRAWING TITLE:
SITE PLAN

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 1/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-003.00

A1 SITE PLAN
1/16" = 1'-0"

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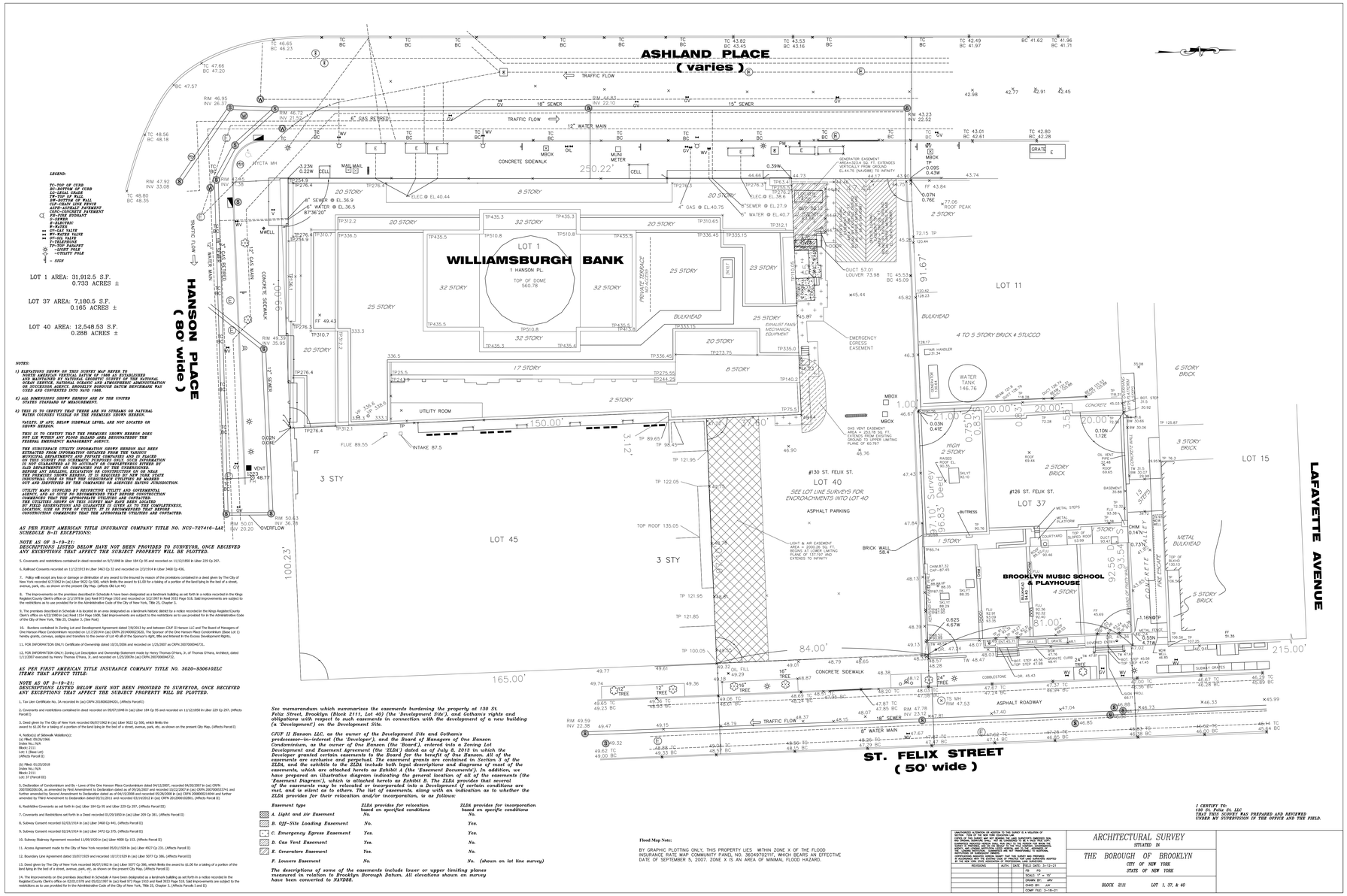
MATERIAL KEYING LEGEND:



See memorandum which summarizes the easements burdening the property at 130 St. Felix Street, Brooklyn (Block 2111, Lot 40) (the 'Development Site'), and Gotham's rights and obligations with respect to such easements in connection with the development of a new building (a 'Development') on the Development Site.

CIVP II Hanson LLC, as the owner of the Development Site and Gotham's predecessor-in-interest (the 'Developer'), and the Board of Managers of One Hanson Condominium, as the owner of One Hanson (the 'Board'), entered into a Zoning Lot Development and Easement Agreement (the 'ZLDA') dated as of July 8, 2013 in which the Developer granted certain easements to the Board for the benefit of One Hanson. All of the easements are exclusive and perpetual. The easement grants are contained in Section 3 of the ZLDA, and the exhibits to the ZLDA include both legal descriptions and diagrams of most of the easements, which are attached hereto as Exhibit A (the 'Easement Documents'). In addition, we have prepared an illustrative diagram indicating the general location of all of the easements (the 'Easement Diagram'), which is attached hereto as Exhibit B. The ZLDA provides that several of the easements may be relocated or incorporated into a Development if certain conditions are met, and is silent as to others. The list of easements, along with an indication as to whether the ZLDA provides for their relocation and/or incorporation, is as follows:

Easement type	*ZLDA provides for relocation based on specified conditions*	*ZLDA provides for incorporation based on specific conditions*
A. Light and Air Easement	*No.*	*No.*
B. Off-Site Loading Easement	*No.*	*Yes.*
C. Emergency Egress Easement	*Yes.*	*Yes.*
D. Gas Vent Easement	*Yes.*	*No.*
E. Generators Easement	*Yes.*	*No.*
F. Louvers Easement	*No.*	*No. (shown on lot line survey)*

The descriptions of some of the easements include lower or upper limiting planes measured in relation to Brooklyn Borough Datum. All elevations shown on survey have been converted to NAVD88.

Flood Map Note:

BY GRAPHIC PLOTTING ONLY, THIS PROPERTY LIES WITHIN ZONE X OF THE FLOOD INSURANCE RATE MAP COMMUNITY PANEL NO. 3604970211F, WHICH BEARS AN EFFECTIVE DATE OF SEPTEMBER 5, 2007. ZONE X IS AN AREA OF MINIMAL FLOOD HAZARD.

UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW.

COPIES OF THIS SURVEY MAP NOT BEARING THE LIVE EMBOSSED SURVEYOR'S SEAL OR SIGNATURE ARE NON-VALID COPIES. ONLY THE ORIGINAL OF THIS SURVEY WITH THE EMBOSSED SURVEYOR SEAL AND SIGNATURE WILL BE ACCEPTED AS VALID. THE CERTIFICATIONS, CERTIFICATES, OPINIONS OR SERVICES REFLECTED ON THIS SURVEY MAP ARE MADE SOLELY FOR THE BENEFIT OF THE PARTIES NAMED HEREON AND NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.

I CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THIS SURVEY WAS PREPARED IN ACCORDANCE WITH THE EXISTING CODE OF PRACTICE FOR LAND SURVEYS ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS.

REVISIONS	AUTH.	DATE

FIELD DATE: 3-12-21
FB - PG
SCALE: 1" = 10'
DRAWN BY: MRV
CHKD BY: JJV
COMP FILE: 3-18-21

ARCHITECTURAL SURVEY
SITUATED IN
THE BOROUGH OF BROOKLYN
CITY OF NEW YORK
STATE OF NEW YORK
BLOCK 2111 LOT 1, 37, & 40

I CERTIFY TO:
CIVP II, Fund II, LLC
THAT THIS SURVEY WAS PREPARED AND REVIEWED UNDER MY SUPERVISION IN THE OFFICE AND THE FIELD.

PRELIMINARY
NOT FOR CONSTRUCTION

SCHEMATIC DESIGN 03.02.2022

NO.	REVISIONS / SUBMISSIONS	DATE

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130 SAINT FELIX BROOKLYN MUSIC SCHOOL

130 Saint Felix Street, Brooklyn, NY 11217

DRAWING TITLE:

EXISTING SITE SURVEY

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/32"=1'-0"

Project No.: 18044.L01

Drawing No.: A-004.00

A1 EXISTING SITE SURVEY
1/16" = 1'-0"

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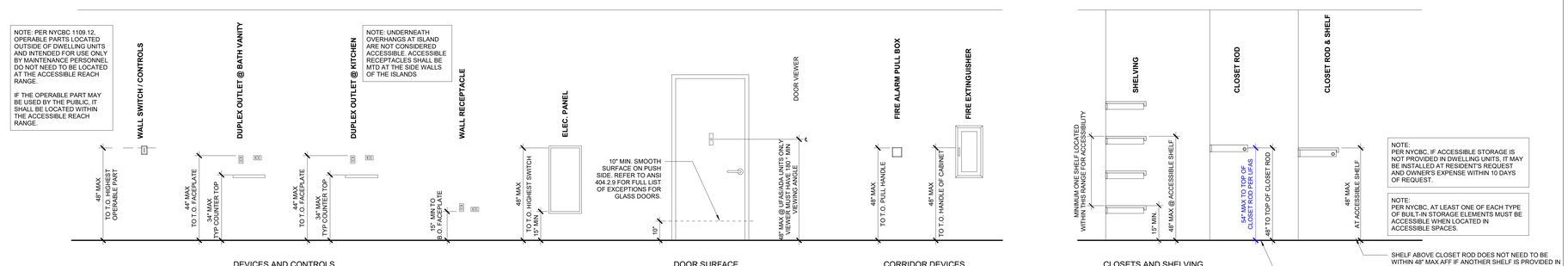


DEVICES AND CONTROLS

REF: ANSI 308.2.1 ADA 308.2.1 FHA 5.6-5.7 UFAS 4.27.3
REF: ANSI 308.2.2 ADA 308.2.2 FHA 5.7-5.8 UFAS 4.27.3
REF: ANSI 308.3.2 ADA 308.3.2 FHA 5.7-5.8 UFAS 4.27.3
REF: ANSI 308.2.1 ADA 308.2.1 FHA 5.8 UFAS 4.27.3
REF: ANSI 308.3.1 NYCBC 1009.12

DOOR SURFACE

REF: ANSI 404.2.9 ADA 404.2.10
REF: ANSI 1006.5.2 ADA 809.5.5.2 UFAS 4.13.9
43"-46" AFF RECOMMENDED FOR EYE HEIGHT ACCESSIBILITY

CORRIDOR DEVICES

REF: ANSI 309.3 ADA 309.3 FHA 5.7 UFAS 4.27.3

ALL DIMENSIONS NOTED ARE FROM FINISHED FLOOR TO FURTHEST REACH (TOP OR BOTTOM) OF OPERABLE CONTROL

NOTE: PER NYCBC, IF ACCESSIBLE STORAGE IS NOT PROVIDED IN DWELLING UNITS, IT MAY BE INSTALLED AT RESIDENT'S REQUEST AND OWNER'S EXPENSE WITHIN 10 DAYS OF REQUEST.

NOTE: PER NYCBC, AT LEAST ONE OF EACH TYPE OF BUILT-IN STORAGE ELEMENTS MUST BE ACCESSIBLE WHEN LOCATED IN ACCESSIBLE SPACES.

CLOSETS AND SHELVING

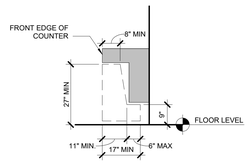
REF: ANSI 905 ADA 811 NYC 1109.8 UFAS 4.25

SHELF ABOVE CLOSET ROD DOES NOT NEED TO BE WITHIN 48" MAX AFF IF ANOTHER SHELF IS PROVIDED IN THE CLOSET WITHIN THE ACCESSIBLE REACH RANGE.

FOR SPACES FOLLOWING ANSI, ONLY A PORTION OF CLOSET ROD NEEDS TO BE 48" MAX AFF. FOR SPACES FOLLOWING UFAS REQUIREMENTS, A PORTION OF CLOSET ROD SHALL BE LOCATED AT 48" AFF FOR ANSI AND ALL OTHER CLOSET RODS AT 54" MAX AFF.

R1 MOUNTING HEIGHT DIAGRAM

1/2" = 1'-0"



KNEE & TOE CLEARANCE SHALL BE 30" WIDE

REF: ANSI 306 ADA 306 FHA 5.7, 7.52 UFAS 4.15.5, 4.19.2, 4.24.3, 4.32.3

R18 KNEE & TOE CLEARANCE

NTS

APPLICABLE LAWS

NYCBC *LL 141, 2014 NYC BC - CHAPTER 11
FHA *FAIR HOUSING ACT
504 *SECTION 504 OF THE REHAB ACT

REFERENCED STANDARDS

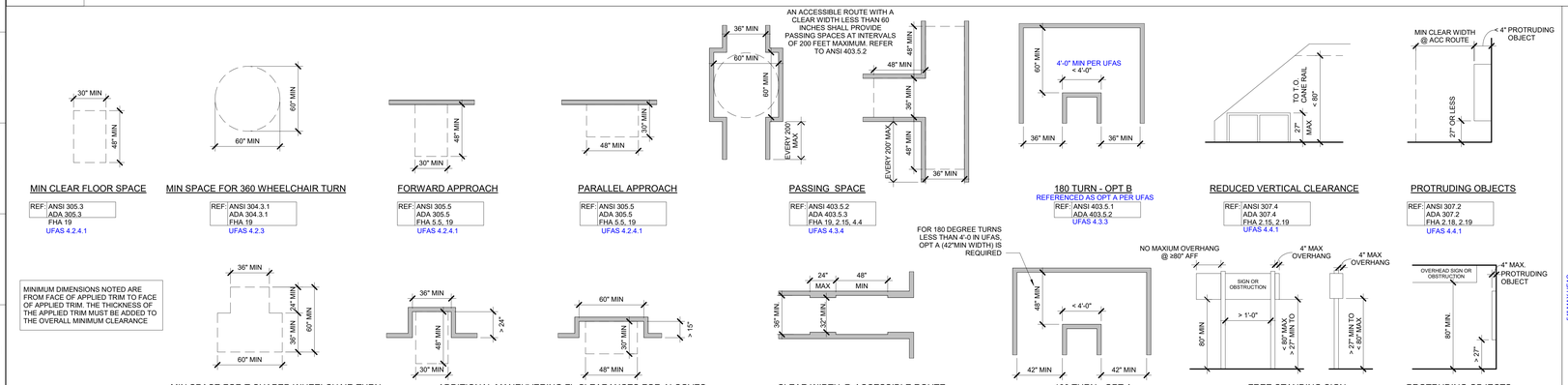
ANSI A117.1-2009
2010 ADA STANDARDS FOR ACCESSIBLE DESIGN AND 2004 ADAAG UNIFORM FEDERAL ACCESSIBILITY STANDARDS

LEGEND

ANSI: ICC AA117.1-2009 ANSI ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES
ADA: 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN
FHA: FAIR HOUSING ACT DESIGN MANUAL
UFAS: UNIFORM FEDERAL ACCESSIBILITY STANDARDS

APPLICABLE LAWS AND REFERENCE STANDARDS TO BE CONFIRMED WITH ACCESSIBILITY CONSULTANT AND LOCAL JURISDICTION

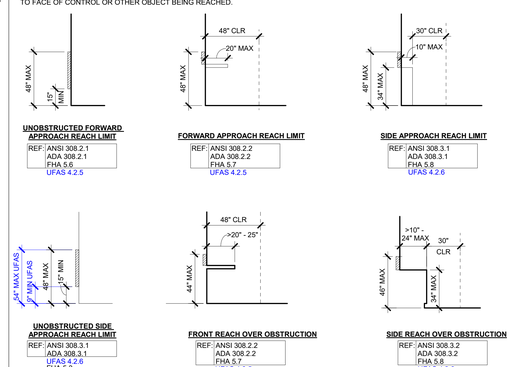
ALL DIAGRAMS INDICATE MINIMUM REQUIREMENTS. MINIMUM REQUIREMENTS MUST BE COORDINATED WITH LAYOUT AND SITE CONDITIONS TO ACCOMODATE CONSTRUCTION TOLERANCES.



L1 ACCESSIBLE ROUTE & CLEAR FLOOR SPACE

1/4" = 1'-0"

NOTE: MAXIMUM REACH IS MEASURED FROM EDGE OF OBSTRUCTION TO FACE OF CONTROL OR OTHER OBJECT BEING REACHED.



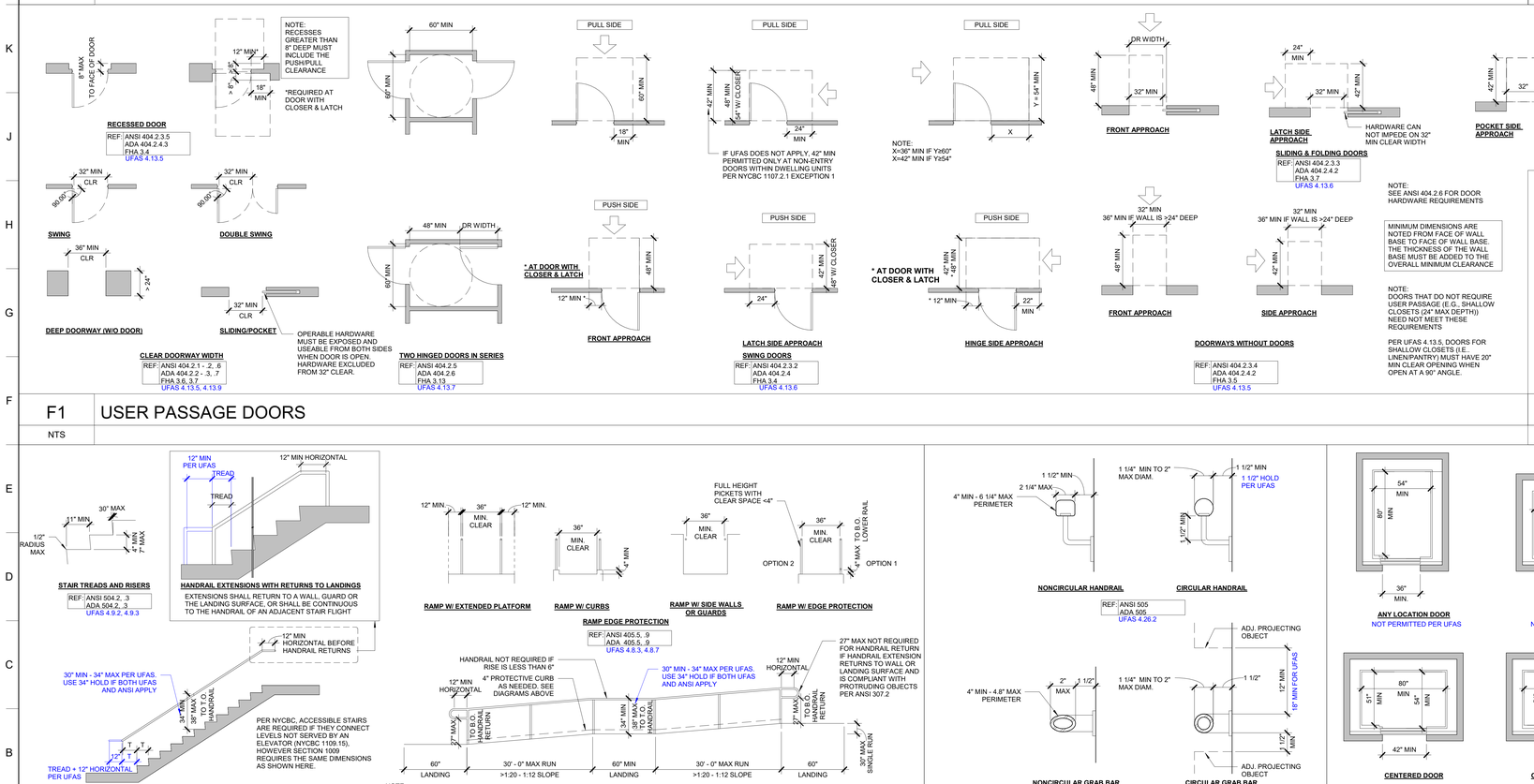
L17 REACH LIMITS

NTS

GENERAL NOTES:

1. DIMENSIONS SHOWN ON ACCESSIBILITY COMPLIANCE DRAWINGS SHOW REGULATORY MINIMUM AND/OR MAXIMUM INSTALLATION REQUIRMENTS PER THE REFERENCED ACCESSIBILITY STANDARDS APPLICABLE TO THE PROJECT. WHERE INCLUDED IN THE ARCHITECTURAL DRAWINGS FOLLOW DIMENSIONS SHOWN ON PLANS, ELEVATIONS, SECTIONS AND DETAILS.

2. CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE ACCESSIBILITY DRAWINGS AND NOTIFY ARCHITECT TO REQUEST CLARIFICATION IN THE EVENT PROJECT DIMENSIONS ARE IN CONFLICT WITH RANGE SHOWN ON ACCESSIBILITY DRAWINGS.



NOTE: SEE ANSI 404.2.6 FOR DOOR HARDWARE REQUIREMENTS

MINIMUM DIMENSIONS ARE NOTED FROM FACE OF WALL BASE TO FACE OF WALL BASE. THE THICKNESS OF THE WALL BASE MUST BE ADDED TO THE OVERALL MINIMUM CLEARANCE

NOTE: DOORS THAT DO NOT REQUIRE USER PASSAGE (E.G., SHALLOW CLOSETS (24" MAX DEPTH)) NEED NOT MEET THESE REQUIREMENTS

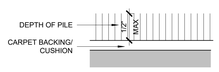
PER UFAS 4.13.5, DOORS FOR SHALLOW CLOSETS (I.E., LINEN/PANTRY) MUST HAVE 20" MIN CLEAR OPENING WHEN OPEN AT A 90° ANGLE.

RECESSED DOOR: REF: ANSI 404.2.3.5 ADA 404.2.4.3 FHA 3.4 UFAS 4.13.5
SWING: DEEP DOORWAY (W/O DOOR): CLEAR DOORWAY WIDTH: REF: ANSI 404.2.1 - 2. 6 ADA 404.2.2 - 3. 7 FHA 3.6, 3.7 UFAS 4.13.5, 4.13.9
DOUBLE SWING: SLIDING/POCKET: TWO HINGED DOORS IN SERIES: REF: ANSI 404.2.5 ADA 404.2.6 FHA 3.13 UFAS 4.13.7
FRONT APPROACH: LATCH SIDE APPROACH: SWING DOORS: REF: ANSI 404.2.3.2 ADA 404.2.4 FHA 3.4 UFAS 4.13.6
LATCH SIDE APPROACH: SLIDING & FOLDING DOORS: REF: ANSI 404.2.3.3 ADA 404.2.4.2 FHA 3.7 UFAS 4.13.6
HINGE SIDE APPROACH: SIDE APPROACH: DOORWAYS WITHOUT DOORS: REF: ANSI 404.2.3.4 ADA 404.2.4.2 FHA 3.5 UFAS 4.13.5

F1 USER PASSAGE DOORS

NTS

EXPOSED CARPET EDGES TO HAVE TRIM, BE FASTENED TO THE FLOOR, AND FOLLOW ANSI 303.3 REQUIREMENTS.

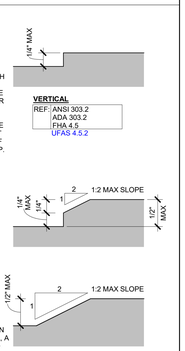


CARPET: REF: ANSI 302.2 ADA 302.2 UFAS 4.5.3

F16 CARPET

NTS — CARPET & AREA RUGS

NOTE: A 4" DROP IS PERMITTED IN DWELLING UNITS AT TERRACES, BALCONIES, ETC. WITH AN IMPERMEABLE SURFACE IF THEY ARE NOT FOR COMMON OR PUBLIC USE. THE STRUCTURE AND GUARDRAILS MUST BE DESIGNED TO PERMIT THE INSTALLATION OF AN ACCESSIBLE RAMP. SEE NYCBC 1107.4.



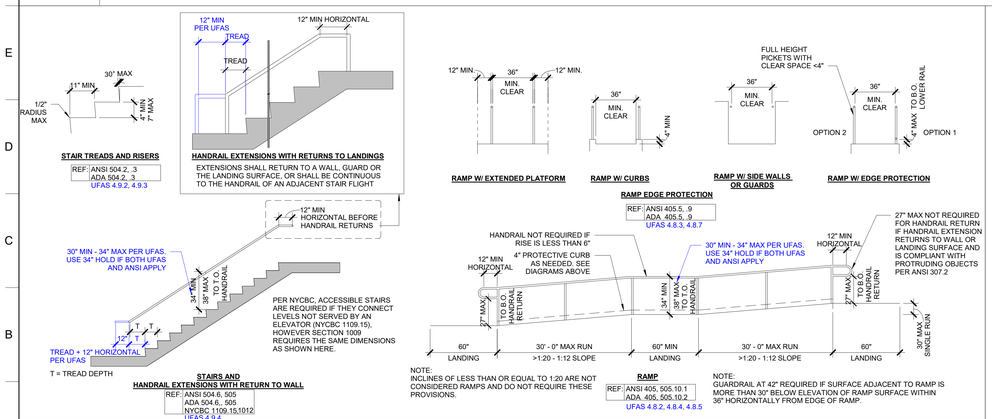
VERTICAL: REF: ANSI 303.2 ADA 303.2 FHA 4.5 UFAS 4.5.2

NOTE: AT DOORS OTHER THAN PRIMARY ENTRY DOOR, A 3/4" DOOR THRESHOLD W/ BEVELED EDGE IS ALLOWED @ EXTERIOR DOORS PER FHA. THIS IS APPLICABLE IN NYC AT SLIDING DOORS ONLY, SEE NYCBC 1008.1.7.

BEVELED: REF: ANSI 303.3 ADA 303.3 FHA 4.5, 4.12 UFAS 4.5.2, 4.13.8

F18 CHANGE IN LEVEL

NTS — INCLUDING DOOR THRESHOLDS



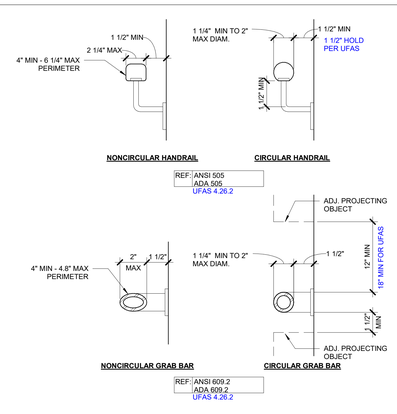
NOTE: INCLINES OF LESS THAN OR EQUAL TO 1:20 ARE NOT CONSIDERED RAMPS AND DO NOT REQUIRE THESE PROVISIONS.

RAMP: REF: ANSI 405, 505.10.1 ADA, 405, 505.10.2 UFAS 4.8.2, 4.8.4, 4.8.5

NOTE: GUARDRAIL AT 42" REQUIRED IF SURFACE ADJACENT TO RAMP IS MORE THAN 30" BELOW ELEVATION OF RAMP SURFACE WITHIN 36" HORIZONTALLY FROM EDGE OF RAMP.

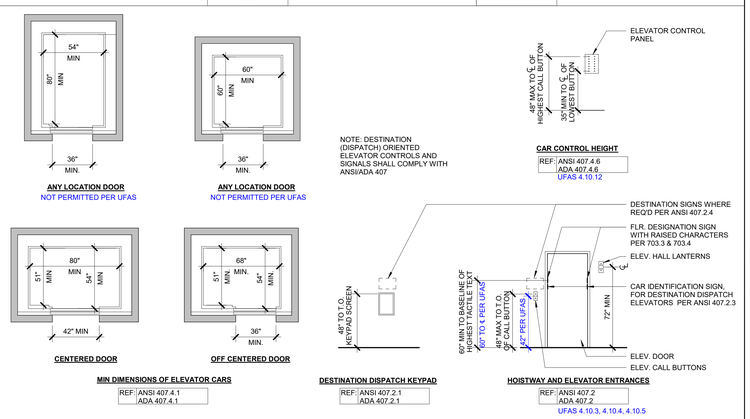
A1 RAMPS & STAIRS

NTS



A10 HANDRAILS AND GRAB BARS

NTS



A15 ELEVATORS

NTS

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	REVISIONS | SUBMISSIONS	DATE
	SCHEMATIC DESIGN	03.02.2022

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DRAWING TITLE:
MINIMUM ACCESSIBILITY REQUIREMENTS PUBLIC

Seal:

Drawn: Author
Checked:
Reviewed:
Date:
Scale: As indicated

Project No.: 18044.L01
Drawing No.: A-005.00

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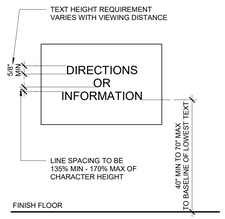
3/2/2022 7:44:08 PM

SIGNS REQUIRED TO FOLLOW VISUAL AND/OR TACTILE ACCESSIBILITY REQUIREMENTS PER ANSI:
(REFER TO NYCBC APPENDIX E)

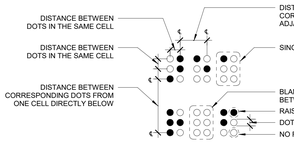
- INTERIOR AND EXTERIOR SIGNS ARE REQUIRED TO IDENTIFY ALL PERMANENT ROOMS AND SPACES, AND SHALL COMPLY WITH VISUAL, TACTILE, AND BRAILLE REQUIREMENTS.
- SIGNS THAT PROVIDE DIRECTION TO OR INFORMATION ABOUT INTERIOR SPACES AND FACILITIES SHALL COMPLY WITH VISUAL SIGN REQUIREMENTS.
- WHERE PICTOGRAMS ARE PROVIDED, PICTOGRAMS SHALL HAVE TACTILE AND BRAILLE TEXT DESCRIPTORS.

SEE ANSI 407.2.3 FOR ELEVATOR SIGN REQUIREMENTS.

VISUAL SIGN REQUIREMENTS

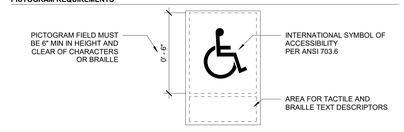


BRAILLE REQUIREMENTS

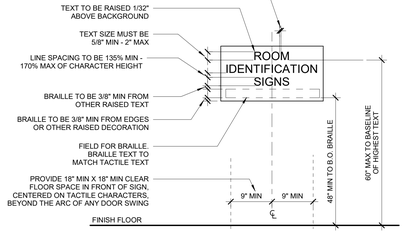


MEASUREMENT RANGE	MINIMUM (INCHES) TO MAXIMUM (INCHES)
DOT BASE DIAMETER	0.059 (1.5MM) TO 0.063 (1.6MM)
DISTANCE BETWEEN TWO DOTS IN SAME CELL	0.090 (2.3 mm) to 0.100 (2.5 mm)
DISTANCE BETWEEN CORRESPONDING DOTS IN ADJACENT CELLS	0.241 (6.1 mm) to 0.300 (7.6 mm)
DOT HEIGHT	0.025 (0.6 mm) to 0.037 (0.9 mm)
DISTANCE BETWEEN CORRESPONDING DOTS FROM ONE CELL DIRECTLY BELOW	0.395 (10.0 mm) to 0.400 (10.2 mm)

PICTOGRAM REQUIREMENTS



TACTILE SIGN REQUIREMENTS



NOTE:
SIGNAGE REQUIREMENTS BELOW ONLY OUTLINE SIGNS THAT MUST COMPLY WITH VISUAL, TACTILE, AND/OR BRAILLE ACCESSIBILITY REQUIREMENTS. LOCAL BUILDING CODES MAY REQUIRE ADDITIONAL TYPES OF SIGNAGE IN BUILDINGS. (EX: ELEVATOR SIGNAGE PER NYBC 407 AND 3002, STAIR SIGNAGE PER 1022.8, AND FIRE CODE IDENTIFICATION SIGNS PER NYCBC 505 HAVE REQUIREMENTS SEPARATE FROM ACCESSIBILITY)

SIGNS REQUIRED TO BE DESIGNED W/ VISUAL AND/OR TACTILE REQUIREMENTS PER NYBC:

PER NYCBC 1007.9:
- SIGNS AT EACH DOOR PROVIDING ACCESS TO AN AREA OF RESCUE ASSISTANCE FROM ADJACENT FLOOR AREA
- SIGNS AT EACH DOOR PROVIDING ACCESS TO AN EXTERIOR AREA FOR ASSISTED RESCUE

PER NYCBC 1011.3:
DISCHARGE IDENTIFICATION TACTILE EXIT SIGNS TO BE LOCATED AT EACH DOOR TO
- AN AREA OF RESCUE ASSISTANCE
- AN EXTERIOR AREA FOR ASSISTED RESCUE
- EXIT STAIRWAY
- EXIT RAMP
- EXIT PASSAGEWAY
- HORIZONTAL EXIT
- EXIT DISCHARGE

PER NYCBC 1022.8:
- STAIRWAY IDENTIFICATION SIGN
- FLOOR IDENTIFICATION SIGN

PER NYCBC 1030:
- STAIR IDENTIFICATION PER 1022.8
- ELEVATOR IDENTIFICATION AND EMERGENCY SIGNS PER 3002.2
- DOOR EXIT SIGNS AS REQ'D PER 1030.4

SIGNS REQUIRED TO HAVE THE INTERNATIONAL SYMBOL OF ACCESSIBILITY PER NYBC:

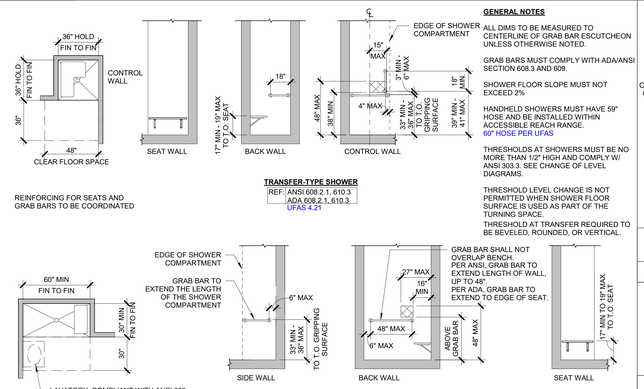
PER NYBC 1110.1:
- ACCESSIBLE PARKING SPACES
- ACCESSIBLE PASSENGER LOADING ZONES
- ACCESSIBLE AREAS OF RESCUE ASSISTANCE
- EXTERIOR AREAS OF ASSISTED RESCUE
- AT CLUSTERED TOILET OR BATHING UNITS WHERE AN ACCESSIBLE TOILET OR BATHING UNIT IS AVAILABLE
- ACCESSIBLE ENTRANCES WHERE NOT ALL ENTRANCES ARE ACCESSIBLE
- ACCESSIBLE CHECKOUT AISLES WHERE NOT ALL AISLES ARE ACCESSIBLE
- FAMILY OR ASSISTED-USE TOILET AND BATHING ROOMS
- ACCESSIBLE DRESSING, FITTING, AND LOCKER ROOMS WHERE NOT ALL ROOMS ARE ACCESSIBLE
- ACCESSIBLE SEATING
- ACCESSIBLE PORTABLE TOILETS (ALSO PER E107.1)
- PUBLIC TELEPHONES

DIRECTIONAL SIGNAGE TO ACCESSIBLE ELEMENTS OR SIGNAGE INDICATING SPECIAL ACCESSIBILITY PROVISIONS ARE REQUIRED PER NYCBC 1110.2 AND 1110.3.

REF: ANSI 703
ADA 703

N1 SIGNAGE ACCESSIBILITY

3" = 1'-0"



GENERAL NOTES

ALL DIMS TO BE MEASURED TO CENTERLINE OF GRAB BAR ESCUTCHEON UNLESS OTHERWISE NOTED.

GRAB BARS MUST COMPLY WITH ADA/ANSI SECTION 608.3 AND 609.

SHOWER FLOOR SLOPE MUST NOT EXCEED 2%

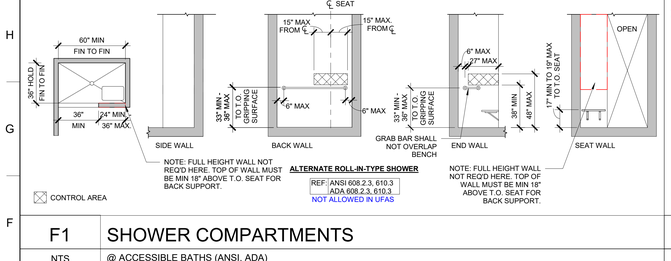
HANDHELD SHOWERS MUST HAVE 59" HOSE AND BE INSTALLED WITHIN ACCESSIBLE REACH RANGE.
60" HOSE PER UFAS

THRESHOLDS AT SHOWERS MUST BE NO MORE THAN 1/2" HIGH AND COMPLY W/ ANSI 303.3. SEE CHANGE OF LEVEL DIAGRAMS.

THRESHOLD LEVEL CHANGE IS NOT PERMITTED WHEN SHOWER FLOOR SURFACE IS USED AS PART OF THE TURNING SPACE.
THRESHOLD AT TRANSFER REQUIRED TO BE BEVELED, ROUNDED, OR VERTICAL.

TRANSFER-TYPE SHOWER
REF: ANSI 608.2.1, 610.3
ADA 608.2.1, 610.3
UFAS 4.21

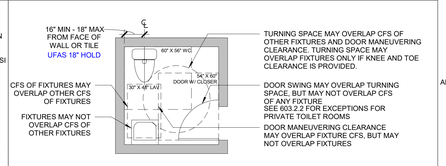
ROLL-IN-TYPE SHOWER
REF: ANSI 608.2.2, 610.3
ADA 608.2.2, 610.3
UFAS 4.21



ALTERNATE ROLL-IN-TYPE SHOWER
REF: ANSI 608.2.3, 610.3
ADA 608.2.3, 610.3
NOT ALLOWED IN UFAS

F1 SHOWER COMPARTMENTS

NTS @ ACCESSIBLE BATHS (ANSI, ADA)

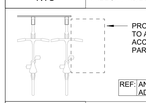


TOILET ROOM WITH DOOR WITH CLOSER
REF: ANSI 404.2.3, 603.2.2, 604.3.3
ADA 603.2.2, 604.3.3
UFAS 4.22.2, 4.22.3, 4.23.3

NOTE: FOR CLARITY, REQUIRED GRAB BARS AND OTHER FIXTURES NOT SHOWN IN THIS DIAGRAM. COORDINATE REQUIRED FIXTURES AND CFS TO BE COORDINATED AS NEEDED FOR ACCESSIBILITY.

L7 TOILET ROOM

NTS ALLOWABLE CLEARANCE OVERLAPS



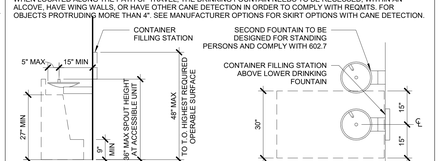
REF: ANSI 309
ADA 309

PUBLIC USE BIKE RACKS:
- MUST BE ON AN ACCESSIBLE ROUTE
- CANNOT PROTRUDE INTO THE CIRCULATION PATH, UNLESS IT IS CANE DETECTABLE
- POSITIONED SO THAT BICYCLES, WHEN PARKED, DO NOT ENCROACH ON THE MINIMUM WIDTH OF THE ACCESSIBLE ROUTE.
- HAVE OPERABLE PARTS WITHIN THE ACCESSIBLE REACH RANGE.
- IF BIKE PARKING INCLUDES BIKE LOCKERS, MINIMUM 5% OF LOCKERS MUST BE ACCESSIBLE.

J7 BIKE PARKING

NTS

NOTE:
WHEN LOCATED ALONG THE PATH OF TRAVEL, THE DRINKING FOUNTAIN NEEDS TO BE RECESSED, WITHIN AN ALCOVE, HAVE WING WALLS, OR HAVE OTHER CANE DETECTION IN ORDER TO COMPLY WITH REQMTS. FOR OBJECTS PROTRUDING MORE THAN 4". SEE MANUFACTURER OPTIONS FOR SHORT OPTIONS WITH CANE DETECTION.



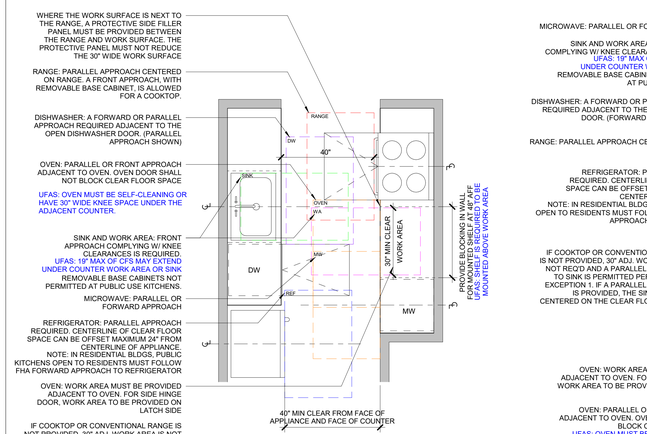
UFAS: 17" MIN - 19" MAX

NOTE:
NO FEWER THAN TWO DRINKING FOUNTAINS SHALL BE PROVIDED, 50% OF WHICH SHALL BE ACCESSIBLE PER ADA 211 AND NYCBC 1109.5.

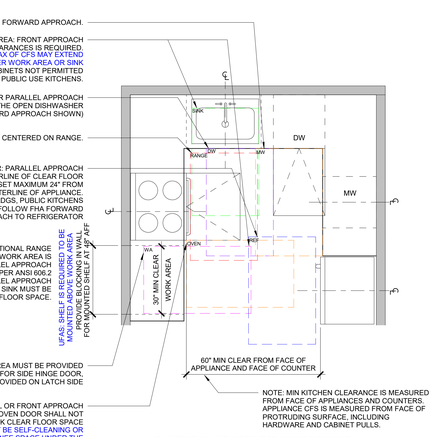
REF: ANSI 602
ADA 602
UFAS 4.15

F7 DRINKING FOUNTAIN

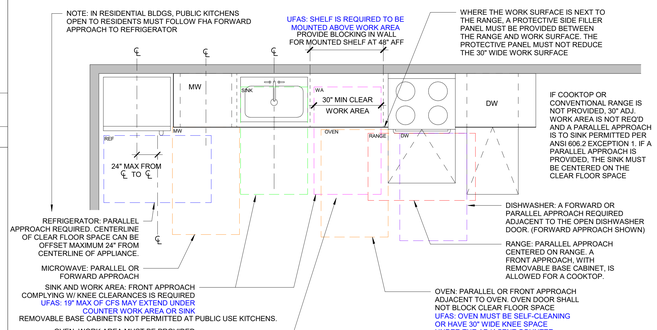
NTS AND CONTAINER FILLING STATION



MINIMUM WIDTH AND APPLIANCE CLEAR FLOOR SPACES @ LINEAR KITCHEN
REF: ANSI 804
ADA 804
NYCBC 1109.4
UFAS 4.34.6



MINIMUM WIDTH AND APPLIANCE CLEAR FLOOR SPACES @ U-SHAPED KITCHEN
REF: ANSI 804
ADA 804
NYCBC 1109.4
UFAS 4.34.6



MINIMUM WIDTH AND APPLIANCE CLEAR FLOOR SPACES @ BAR KITCHEN

GENERAL KITCHEN NOTES

- OPERABLE PARTS OF AN APPLIANCE SHALL HAVE A FORWARD OR PARALLEL APPROACH AND BE LOCATED WITH THE CORRESPONDING REACH RANGE.
- OPERABLE PARTS SHALL BE OPERABLE WITH ONE HAND AND SHALL NOT REQUIRE TIGHT GRASPING, PINCHING, OR TWISTING OF THE WRIST.
- CONTROLS FOR RANGE/ COOKTOP/ OVEN MUST NOT REQUIRE THE USER TO REACH OVER A BURNER. WHERE DOUBLE OVENS ARE PROVIDED, ONE OVEN INTERIOR AND ITS CONTROLS MUST BE LOCATED WITHIN THE ALLOWED REACH RANGE.
- FINISHED SURFACE MUST BE PROVIDED AT THE SIDES OF MILLWORK AND WALL SURFACE THAT ARE EXPOSED ONCE CABINETS ARE REMOVED. FLOOR FINISH MUST EXTEND UNDER THE CABINETRY.
- IF RECEPTACLES ARE PROVIDED AT THE BACKSPLASH, COUNTERTOPS MUST BE LOCATED AT MAX 34" AFF TO COMPLY W/ ACCESSIBLE REACH LIMITS. REFER TO ANSI 308.
- COMBINATION REFRIGERATOR/ FREEZERS MUST HAVE 50% OF FREEZER STORAGE SHELVES, INCLUDING THE BOTTOM OF THE FREEZER, AT 54" OR BELOW. IF LESS THAN 100% OF THE FREEZER STORAGE IS BELOW 54" AFF, THE FREEZER SHALL BE SELF-DEFROSTING.
- COUNTER DEPTH TO BACKSPLASH MUST BE 24" MAX TO FOLLOW ANSI AND ADA ACCESSIBLE REACH RANGE.

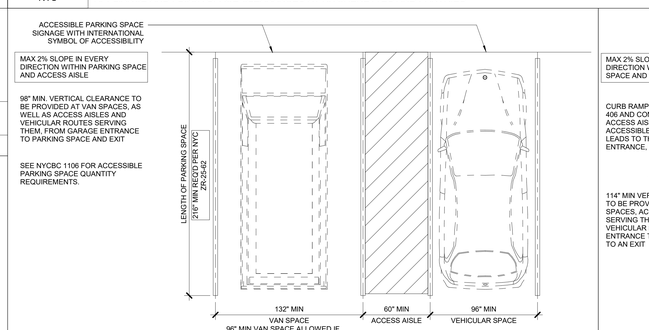
NOTE:
KITCHENS OR KITCHENETTES IN OFFICES, PUBLIC AREAS, EMPLOYEE WORK AREAS ARE CONSIDERED PUBLIC USE AND MUST COMPLY W/ THE PROJECT'S APPLICABLE REGULATIONS. SEE NYCBC 1103.2.3 FOR EXCEPTIONS. REFER TO DEFINITION FOR EMPLOYEE WORK AREA IN NYCBC.

PUBLIC KITCHENS OR KITCHENETTES IN RESIDENTIAL BUILDINGS THAT ARE OPEN TO RESIDENT USE MUST FOLLOW FHA REQUIREMENTS ON A-007.

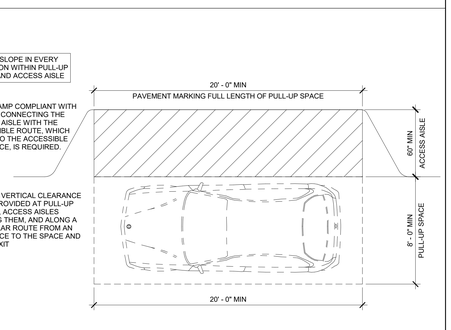
UFAS:
-- VERTICAL SIDE-BY-SIDE REFRIGERATOR / FREEZER TYPES MEET UFAS ACCESSIBLE REQUIREMENTS.
FOR OVER-UNDER REFRIGERATOR/FREEZERS, 100% OF REFRIGERATOR SPACE MUST BE UNDER 54" AND 50% OF FREEZER BOX MUST BE UNDER 54" AFF.
-- LOWER CABINET HARDWARE MUST BE MOUNTED AS CLOSE TO TOP OF DOOR AS POSSIBLE. UPPER CABINETS, AS CLOSE TO BOTTOM OF DOOR AS POSSIBLE.
-- 6-1/2" MAX SINK DEPTH
-- 2" MAX COUNTERTOP THICKNESS

N11 KITCHEN CLEARANCES AT PUBLIC-USE KITCHENS

NTS APPLIANCE AND FLOOR SPACE CLEARANCES AT KITCHENETTES AND PANTRIES



REF: ANSI 502.2, .4, .6
ADA 502.2, .3, .6
NYCBC 1106
FHA 2.20
UFAS 4.6.3



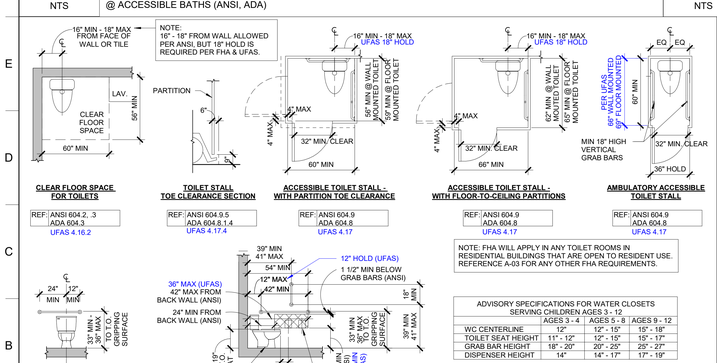
REF: ANSI 503.2, .3
ADA 503.2, .3
NYCBC 1106
FHA 2.21
UFAS 4.6.5

F11 ACCESSIBLE PARKING SPACES

NTS

F16 ACCESSIBLE PASSENGER LOADING ZONE

NTS



REF: ANSI 604.2, .3
ADA 604.3
UFAS 4.16.2

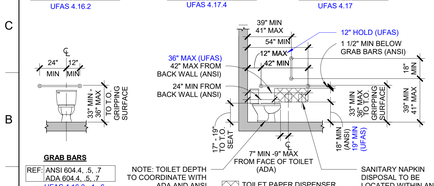
REF: ANSI 604.9.5
ADA 604.8.1.4
UFAS 4.17.4

REF: ANSI 604.9
ADA 604.8
UFAS 4.17

REF: ANSI 604.9
ADA 604.8
UFAS 4.17

REF: ANSI 604.9
ADA 604.8
UFAS 4.17

NOTE: FHA WILL APPLY IN ANY TOILET ROOMS IN RESIDENTIAL BUILDINGS THAT ARE OPEN TO RESIDENT USE. REFERENCE A-03 FOR ANY OTHER FHA REQUIREMENTS.



REF: ANSI 604.4, .5, .7
ADA 604.4, .5, .7
UFAS 4.16.3, .4, .6

NOTE: TOILET DEPTH TO COORDINATE WITH ADA AND ANSI DISPENSER REQUIREMENTS

TOILET PAPER DISPENSER LOCATION (ANSI)

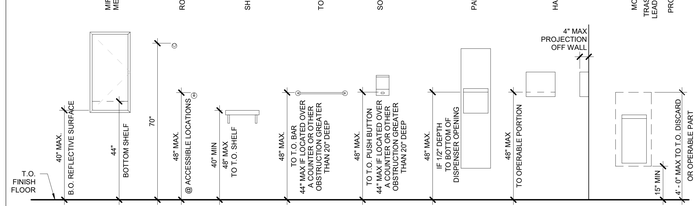
ADVISORY SPECIFICATIONS FOR WATER CLOSETS SERVING CHILDREN AGES 3 - 12			
	AGES 3 - 4	AGES 5 - 8	AGES 9 - 12
WC CENTERLINE	12"	12" - 15"	15" - 18"
TOILET SEAT HEIGHT	11" - 12"	12" - 15"	15" - 17"
GRAB BAR HEIGHT	18" - 20"	20" - 25"	25" - 27"
DISPENSER HEIGHT	14"	14" - 17"	17" - 19"

COORDINATE FIXTURE HEIGHTS FOR CONSISTENCY. PER ADA/ANSI 606.2, COUNTER SURFACE OR RIM OF LAVATORIES AND SINKS CAN BE INSTALLED AT 31" AFF IF PRIMARILY SERVING CHILDREN AGES 6-12 YEARS. SEE 606.2 FOR KNEE CLEARANCE EXCEPTION.
HAND OPERATED FLUSH CONTROLS SHALL BE LOCATED ON THE OPEN SIDE OF THE WATER CLOSET

A1 ACCESSIBLE AND AMBULATORY ACCESSIBLE W.C.

NTS @ ACCESSIBLE PUBLIC BATHS (ANSI, ADA)

NOTE:
PER NYCBC, ONE OF EACH TYPE OF BUILT-IN STORAGE ELEMENTS MUST BE ACCESSIBLE WHEN LOCATED IN ACCESSIBLE SPACES.



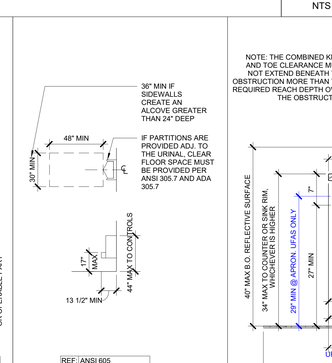
REF:	ANSI 603.3 ADA 603.3	ANSI 603.4	ANSI 603.4 ADA 603.4	ANSI 905.3, 308.2	ANSI 309	ANSI 603.6	ANSI 603.6	ANSI 307.2	ANSI 307.2, 308.3 ADA 307.2

ALL DIMENSIONS ARE FROM T.O. FINISH FLOOR

SEE ANSI 603.6 FOR MORE PERMISSIBLE DEPTH/HEIGHT REACH COMBINATIONS.

A7 BATH MOUNTING HEIGHT DIAGRAM

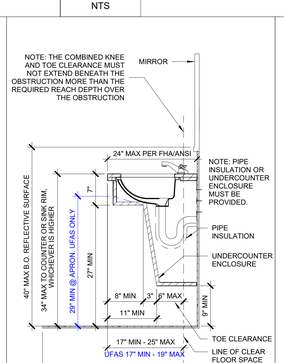
NTS



REF: ANSI 605
ADA 605
UFAS 4.18

A14 URINAL

NTS @ ACCESSIBLE BATHS


NOTE: THE COMBINED KNEE AND TOE CLEARANCE MUST NOT EXTEND BENEATH THE OBSTRUCTION MORE THAN THE REQUIRED REACH DEPTH OVER THE OBSTRUC

APPLICABLE LAWS

NYCBC *LL 141, 2014 NYC BC - CHAPTER 11, APPENDIX P
FHA *FAIR HOUSING ACT
504 *SECTION 504 OF THE REHAB ACT

REFERENCED STANDARDS

ANSI 117.1-2009
2010 ADA STANDARDS FOR ACCESSIBLE DESIGN AND 2004 ADAAG
UNIFORM FEDERAL ACCESSIBILITY STANDARDS

ADA STANDARD APPLIES TO PUBLIC USE SPACES AND DOES NOT APPLY TO RESIDENTIAL UNITS.
FHA REGULATION APPLIES TO ALL SPACES WITHIN A RESIDENTIAL BUILDING THAT IS OPEN TO RESIDENT USE, INCLUDING DWELLING UNITS, AMENITIES, AND RESIDENTIAL OUTDOOR AREAS.

LEGEND

ANSI: ICC A117.1-2009 ANSI ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES
ADA: 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN
FHA: FAIR HOUSING ACT DESIGN MANUAL
UFAS: UNIFORM FEDERAL ACCESSIBILITY STANDARDS

APPLICABLE LAWS AND REFERENCE STANDARDS TO BE CONFIRMED WITH ACCESSIBILITY CONSULTANT AND LOCAL JURISDICTION

NOTE TO USER:
TYPE-A OR TYPE-B REFERS TO ANSI REGULATIONS, UNLESS OTHERWISE NOTED.

PER NYCBC 1107.2.2, TYPE B+NYC DWELLING UNITS SHALL COMPLY WITH APPENDIX P. APPENDIX P FOLLOWS ANSI TYPE-B TOILET AND BATHING ROOMS WITH ADDITIONAL REGULATIONS. NYCBC 1107.2.2 PROVIDES AN EXCEPTION TO APPENDIX P BATHS IF AT LEAST ONE TOILET AND BATHING ROOM COMPLYING WITH ANSI TYPE-A IS PROVIDED WITHIN A TYPE B+NYC DWELLING UNIT.

GENERAL NOTES:

1. DIMENSIONS SHOWN ON ACCESSIBILITY COMPLIANCE DRAWINGS SHOW REGULATORY MINIMUM AND/OR MAXIMUM INSTALLATION REQUIRMENTS PER THE REFERENCED ACCESSIBILITY STANDARDS APPLICABLE TO THE PROJECT. WHERE INCLUDED IN THE ARCHITECTURAL DRAWINGS FOLLOW DIMENSIONS SHOWN ON PLANS, ELEVATIONS, SECTIONS AND DETAILS.

2. CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE ACCESSIBILITY DRAWINGS AND NOTIFY ARCHITECT TO REQUEST CLARIFICATION IN THE EVENT PROJECT DIMENSIONS ARE IN CONFLICT WITH RANGE SHOWN ON ACCESSIBILITY DRAWINGS.

P1 KITCHEN CLEARANCES FOR RESIDENTIAL AND AMENITY KITCHENS

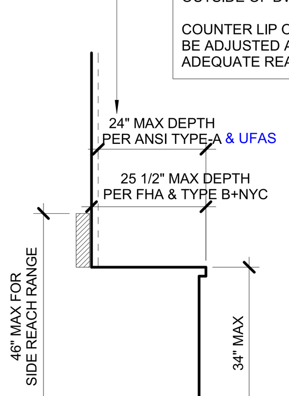
1/2" = 1'-0" — @ ANSI TYPE A & TYPE B+NYC KITCHENS

NOTE:

25 1/2" DEPTH ALLOWED ONLY WITHIN DWELLING UNITS THAT ARE NOT ANSI TYPE-A NOR UFAS.

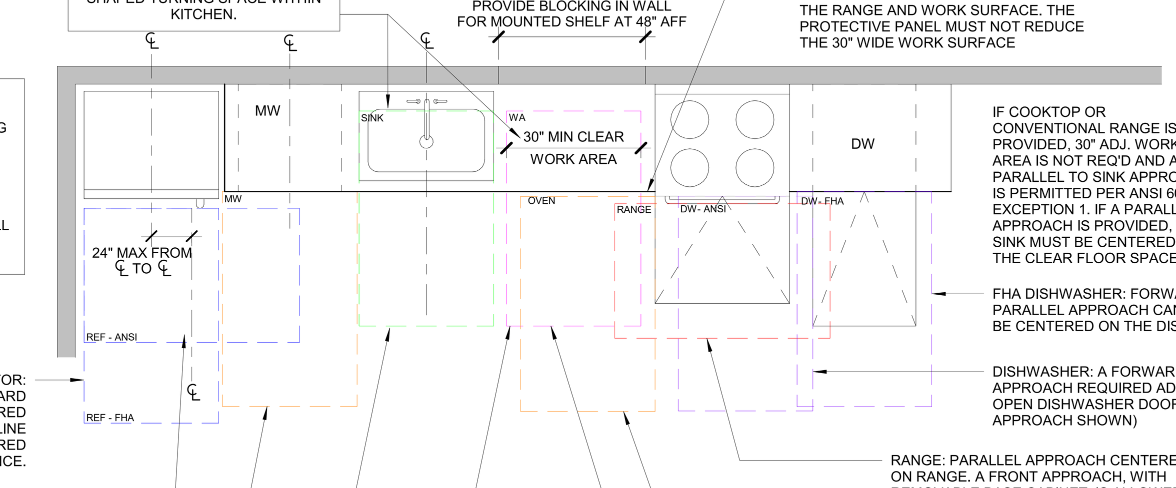
24" DEPTH MUST BE FOLLOWED ANYWHERE OUTSIDE OF DWELLING UNITS.

COUNTER LIP OR BUMP OUT BACKSPLASH SHALL BE ADJUSTED AS NEEDED TO PROVIDE ADEQUATE REACH RANGE TO OUTLETS, ETC.



COUNTER DEPTHS

REF: ANSI 308.3.2, 1004.9
FHA 5.8
NYCBC 1107.2.3
UFAS 4.2.6



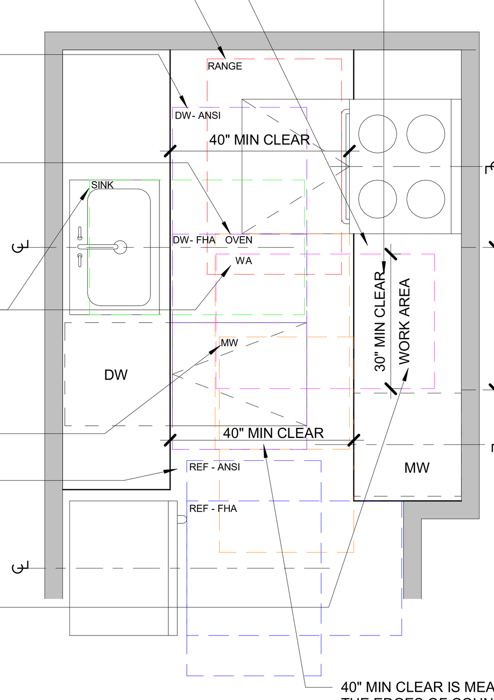
MINIMUM WIDTH AND APPLIANCE CLEAR FLOOR SPACES @ BAR KITCHEN

NOTE:
PER NYCBC 1107.2.3, PRIMARY KITCHENS IN TYPE B+NYC DWELLING UNITS MUST COMPLY WITH ANSI TYPE-A KITCHENS PER ANSI 1003.12. SECONDARY KITCHENS MAY COMPLY WITH ANSI TYPE-B KITCHENS. SEE ANSI 1004.12 FOR TYPE-B KITCHENS.

ADDITIONAL REGULATIONS PER FHA:

FHA PERMITS THE RANGE CONTROLS TO BE AT THE FRONT, SIDE, OR BACK OF THE APPLIANCE.

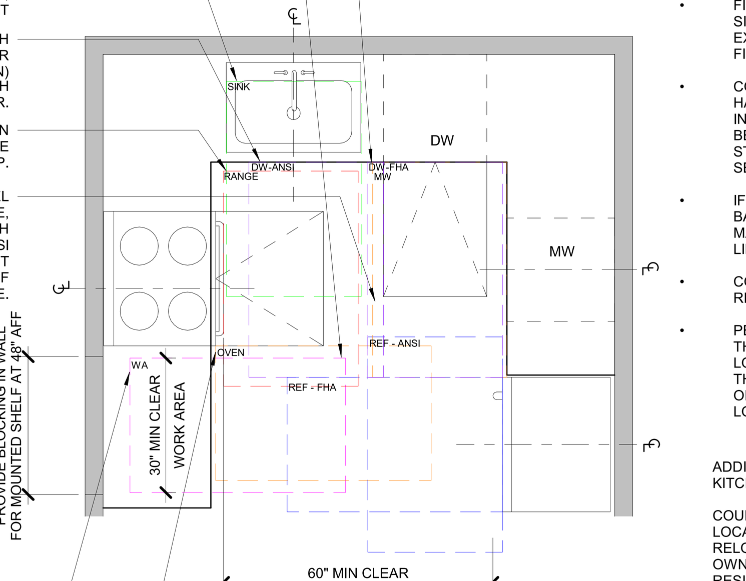
FHA REQUIRES PARALLEL OR FRONT APPROACH AT TRASH COMPACTORS (NOT SHOWN)



IF A KITCHEN ISLAND IS PROVIDED, 40" MIN CLEARANCE MUST BE PROVIDED BETWEEN THE FACE OF ISLAND AND THE FACE OF ADJ. COUNTER OR APPLIANCES, EXCLUSIVE OF PULL HARDWARE AND CABINET PULLS, ON ALL SIDES

MINIMUM WIDTH AND APPLIANCE CLEAR FLOOR SPACES @ LINEAR KITCHEN

REF: ANSI 1003.12
FHA CH.7A
UFAS 4.34.6



IF A KITCHEN ISLAND IS PROVIDED, 40" MIN CLEARANCE MUST BE PROVIDED BETWEEN THE ISLAND AND THE ADJ. COUNTER/APPLIANCES, EXCLUSIVE OF PULL HARDWARE AND CABINET PULLS, ON ALL SIDES

MINIMUM WIDTH AND APPLIANCE CLEAR FLOOR SPACES @ U-SHAPED KITCHEN

REF: ANSI 1003.12
NYCBC 1107.2.3
FHA CH.7A
UFAS 4.34.6

GENERAL KITCHEN NOTES

- OPERABLE PARTS OF AN APPLIANCE SHALL HAVE A FORWARD OR PARALLEL APPROACH AND BE LOCATED WITH THE CORRESPONDING REACH RANGE.
- FINISHED SURFACE MUST BE PROVIDED AT THE SIDES OF MILLWORK AND WALL SURFACE THAT ARE EXPOSED ONCE CABINETS ARE REMOVED. FLOOR FINISH MUST EXTEND UNDER THE CABINETRY.
- COMBINATION REFRIGERATOR/ FREEZERS MUST HAVE 50% OF FREEZER STORAGE SHELVES, INCLUDING THE BOTTOM OF THE FREEZER, AT 54" OR BELOW. IF LESS THAN 100% OF THE FREEZER STORAGE IS BELOW 54" AFF, THE FREEZER SHALL BE SELF-DEFROSTING
- IF RECEPTACLES ARE PROVIDED AT THE BACKSPLASH, COUNTERTOPS MUST BE LOCATED AT MAX 34" AFF TO COMPLY W/ ACCESSIBLE REACH LIMITS. REFER TO ANSI 308.
- CONTROLS FOR RANGE/ COOKTOP MUST NOT REQUIRE THE USER TO REACH OVER A BURNER.
- PER ANSI, CONTROLS FOR OVEN MUST NOT REQUIRE THE USER TO REACH OVER A BURNER AND MUST BE LOCATED ON THE FRONT PANEL, ON EITHER SIDE OF THE DOOR. WHERE DOUBLE OVENS ARE PROVIDED, ONE OVEN INTERIOR AND ITS CONTROLS MUST BE LOCATED WITHIN THE ALLOWED REACH RANGE.

ADDITIONAL REGULATIONS PER NYCBC FOR TYPE B+NYC KITCHENS:

COUNTER AND SINKS HEIGHTS DO NOT NEED TO BE LOCATED AT 34" MAX AFF, AS LONG AS THEY CAN BE RELOCATED PER ANSI & NYCBC. PER NYCBC, THE OWNER MAY BE RELOCATE COUNTER AT THE RESIDENT'S REQUEST, WITHIN TEN DAYS OF REQUEST, AND AT THE OWNER'S EXPENSE.

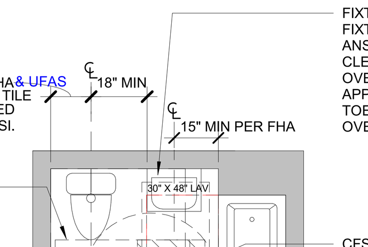
PER NYCBC, IF APPLIANCE CONTROLS ARE NOT WITHIN ACCESSIBLE REACH RANGE, THE OWNER MAY BE REPLACE SUCH APPLIANCES AT THE RESIDENT'S REQUEST, WITHIN TEN DAYS OF REQUEST, AND AT THE OWNER'S EXPENSE.

PER NYCBC, OVEN CONTROLS DO NOT NEED TO BE LOCATED ON EITHER SIDE OF THE DOOR, IF CONTROLS ARE ACCESSIBLE WITHOUT REACHING ACROSS BURNERS.

UFAS:
-- VERTICAL SIDE-BY-SIDE REFRIGERATOR / FREEZER TYPES MEET UFAS ACCESSIBLE REQUIREMENTS. FOR OVER-UNDER REFRIGERATOR/FREEZERS, 100% OF REFRIGERATOR SPACE MUST BE UNDER 54" AND 50% OF FREEZER BOX MUST BE UNDER 54" AFF.
-- LOWER CABINET HARDWARE MUST BE MOUNTED AS CLOSE TO TOP OF DOOR AS POSSIBLE. UPPER CABINETS, AS CLOSE TO BOTTOM OF DOOR AS POSSIBLE.
-- 6-1/2" MAX SINK DEPTH
-- 2" MAX COUNTERTOP THICKNESS

K8 TOILET ROOM - RESIDENTIAL

1/4" = 1'-0" — ALLOWABLE CLEARANCE OVERLAPS

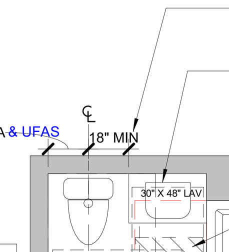


NOTE: THIS LAYOUT COMPLIES WITH FHA SPECIFICATION-B AND NYC APPENDIX P.

DOOR MUST SWING OUT FOR UFAS COMPLIANCE.

RESIDENTIAL BATHROOM CLEARANCE OVERLAPS TYPE-A

REF: ANSI 1003.11.3.1
NYCBC APPENDIX P
FHA CH 7B
UFAS 4.34.5



RESIDENTIAL BATHROOM CLEARANCE OVERLAPS TYPE-B (OPTION A)

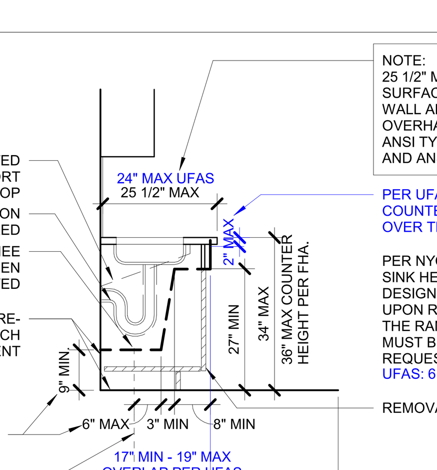
REF: ANSI 1004.11.3.1
NYCBC APPENDIX P
FHA CH 7B
UFAS 4.34.5

NOTE:
THIS LAYOUT COMPLIES WITH FHA SPECIFICATION-B AND NYC APPENDIX P.

K17 SECTION

NTS — @ REMOVABLE KITCHEN CABINET WITHIN DWELLING UNITS

NOTE:
25 1/2" MAX DIM IS FROM EDGE OF WORK SURFACE TO FACE OF BACKSPLASH OR WALL AND INCLUDES COUNTER OVERHANG, AS ALLOWED PER FHA AND ANSI TYPE-B KITCHENS. 24" MAX IN UFAS AND ANSI TYPE-A UNITS.

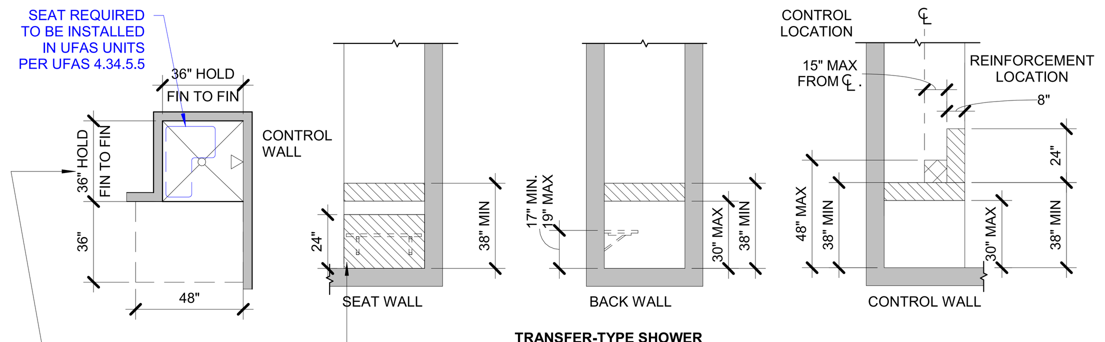


PER NYCBC, THE WORK SURFACE AND SINK HEIGHT MAY BE ADJUSTED, OR DESIGNED TO BE REPLACED AS A UNIT, UPON REQUEST OF RESIDENT, WITHIN THE RANGE OF 29" - 36". MODIFICATIONS MUST BE MADE WITHIN 10 DAYS OF REQUEST AT THE OWNER'S EXPENSE.
UFAS: 6 1/2" MAX SINK DEPTH

REF: ANSI 1003.12
NYCBC 1107.2.3
FHA CH. 7A
UFAS 4.34.6

F1 SHOWER COMPARTMENTS

NTS — @ ANSI TYPE-A, TYPE B+NYC, & UFAS ADAPTABLE BATHS



NOTE:
PER FHA: CFS MUST BE ALIGNED TO CONTROL WALL IN A SPEC-B SHOWER.

TRANSFER-TYPE SHOWER

NOTE:
PER FHA: SEAT REINFORCING REQUIRED AT 36"x36" SHOWERS ONLY, AND RECOMMENDED AT ALL SHOWERS STALL SIZES.
PER ANSI: REINFORCING REQUIRED AT ALL TYPE-A SHOWERS AND 36"x36" TYPE-B SHOWERS ONLY.

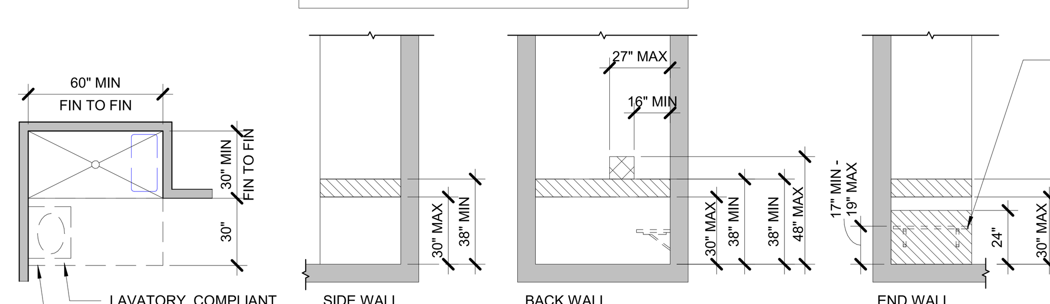
GENERAL NOTES

THRESHOLDS AT SHOWERS MUST BE NO MORE THAN 1/2" WITH A 1:2 BEVEL ON THE SIDES. HIGH AND COMPLY W/ ANSI 303.3. SEE CHANGE OF LEVEL DIAGRAMS. LEVEL CHANGE IS NOT PERMITTED WHEN A TURNING SPACE USES THE SHOWER FLOOR AS PART OF THE TURNING SPACE.

ALL DIMS TO BE MEASURED TO CENTERLINE OF GRAB BAR ESCUTCHEON UNLESS OTHERWISE NOTED.

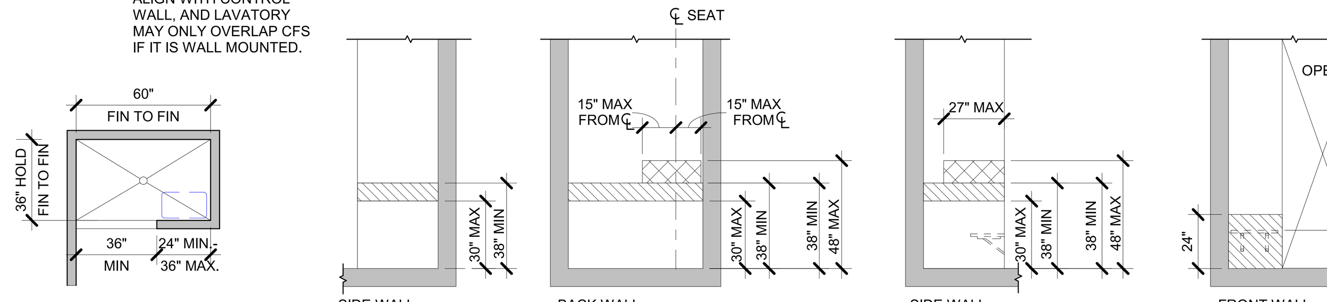
SHOWER FLOOR SLOPE MUST NOT EXCEED 2%

PER NYCBC, WHERE A HAND SHOWER IS NOT PROVIDED, A HAND SHOWER MAY BE PROVIDED UPON RESIDENT REQUEST, AT OWNER'S EXPENSE AND WITHIN 10 DAYS. HANDHELD SHOWERS MUST HAVE 59" HOSE AND BE INSTALLED WITHIN ACCESSIBLE REACH RANGE.
HAND SHOWER WITH 60" HOSE REQUIRED TO BE INSTALLED PER UFAS



NOTE:
PER FHA: CFS MUST ALIGN WITH CONTROL WALL, AND LAVATORY MAY ONLY OVERLAP CFS IF IT IS WALL MOUNTED.

ROLL-IN-TYPE SHOWER



ALTERNATE ROLL-IN-TYPE SHOWER

REF: ANSI 1003.11.2.5.2, 1004.11.3.1.3.3
NYCBC P102.9.2
FHA 6.13, 7.56-.59
UFAS 4.34.5.5

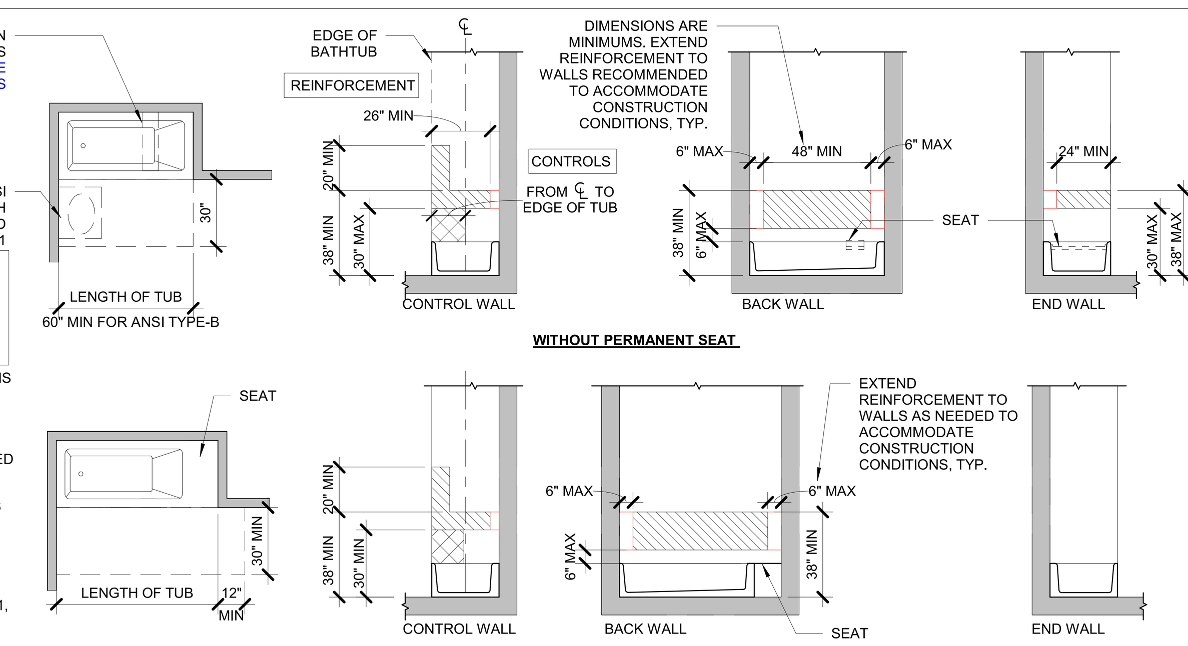
ALTERNATE ROLL-IN TYPE SHOWERS NOT PERMITTED IN UFAS

AREA OF GRAB BAR OR SEAT REINFORCEMENT

CONTROL AREA

F8 BATHTUBS

NTS — @ ANSI TYPE-A, TYPE B+NYC, & UFAS ADAPTABLE BATHS



NOTE:
THE REINFORCING DIMENSIONS SHOWN MEETS THE FHA. EXTENDING REINFORCEMENT TO WALLS IS RECOMMENDED TO ACCOMMODATE CONSTRUCTION TOLERANCES, TYP.

PER NYCBC, WHERE A HAND SHOWER IS NOT PROVIDED, A HAND SHOWER MAY BE PROVIDED UPON RESIDENT REQUEST, AT OWNER'S EXPENSE AND WITHIN 10 DAYS. HANDHELD SHOWERS MUST HAVE 59" HOSE AND BE INSTALLED WITHIN ACCESSIBLE REACH RANGE.
HAND SHOWER WITH 60" HOSE REQUIRED TO BE INSTALLED PER UFAS

CONTROL AREA INCLUDES DIVERTER CONTROL

PERMANENT SEAT NOT REQ'D IN DWELLING UNITS PER ANSI 1003.11.2.5.1, NYCBC 28.2-P102.9.1

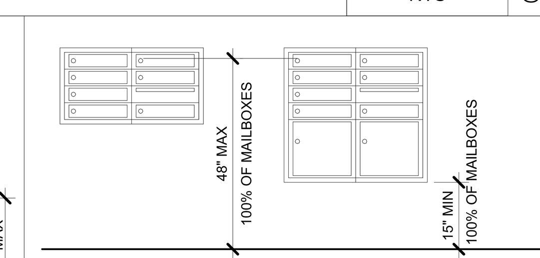
AREA OF REQUIRED GRAB BAR REINFORCEMENT

CONTROL AREA

REF: ANSI 1003.11.2.5.1, 1004.11.3.1.3
NYCBC P102.9.1
FHA 6.9, 7.53-7.55
UFAS 4.34.5.4

H16 ACCESSIBLE MAILBOXES

NTS



REF: ANSI 309
NYCBC 1107.3.1
ADA 309

GENERAL NOTE

TENANT MAILBOXES FALL UNDER PUBLIC USE RESIDENTIAL COMMON AREAS AND MUST COMPLY WITH FHA, ANSI, AND ADA STANDARDS. DIMENSIONS SHOWN HERE ARE FOR ACCESSIBILITY ONLY.

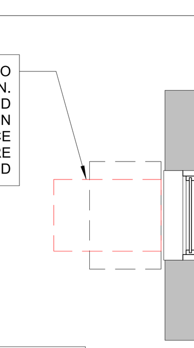
PER ADA, AT LEAST 5%, BUT NO FEWER THAN ONE, MUST COMPLY WITH REACH RANGE.
PER FHA/ANSI, ALL MAILBOXES MUST COMPLY WITH REACH RANGE PER ADA/ANSI 309.

USPS HAS MORE DETAILED REGULATIONS. REFER TO USPS NYC REGULATIONS FOR MAILBOXES.

F16 WINDOW CONTROLS

NTS — @ TYPE B+NYC DWELLING UNITS

NOTE: PARALLEL APPROACH TO OPERABLE WINDOW IS SHOWN. FORWARD APPROACH IS ALLOWED IF THE WINDOW CONTROL WITHIN 10" OF THE CLEAR FLOOR SPACE OR IF ADAPTABLE DEVICES ARE PROVIDED



REF: NYCBC 1107.2.4

WINDOWS PROVIDING REQUIRED NATURAL VENTILATION MUST PROVIDE CLEAR FLOOR SPACE. WINDOW CONTROLS MUST BE LOCATED WITHIN AN ALLOWABLE REACH RANGE. IF WINDOW CONTROLS ARE NOT WITHIN THE ALLOWABLE REACH RANGE, THEY MUST BE DESIGNED TO BE USED WITH ADAPTIVE DEVICES. SUCH DEVICES MUST BE PROVIDED UPON RESIDENT'S REQUEST, AT OWNER'S EXPENSE, WITHIN 10 DAYS. WINDOWS IN KITCHENETTES AND BATHROOMS THAT ARE MECHANICALLY VENTED NEED NOT COMPLY WITH THE ABOVE. ADAPTABILITY PROVISIONS NOT PERMITTED IN UFAS UNITS.

WINDOWS PROVIDING EMERGENCY EGRESS NEED ONLY PROVIDE CLEAR FLOOR SPACE PER ANSI 1002.13.2. SEE NYCBC 1029 FOR ADDITIONAL EMERGENCY ESCAPE AND RESCUE REQUIREMENTS.

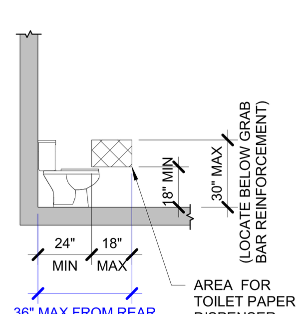
OPERABLE PARTS SHALL BE OPERABLE WITH ONE HAND AND SHALL NOT REQUIRE TIGHT GRASPING, PINCHING OR TWISTING OF THE WRIST. THE FORCE REQUIRED TO ACTIVATE OPERABLE PARTS SHALL BE 5.0 LBS MAX PER ANSI 309.4

OPERABLE/MANEUVERING ELEMENTS MUST NOT EXCEED REACH RANGES PER ANSI/ADA SECTION 308.

PRELIMINARY
NOT FOR CONSTRUCTION

A1 TOILET PAPER DISPENSER

NTS

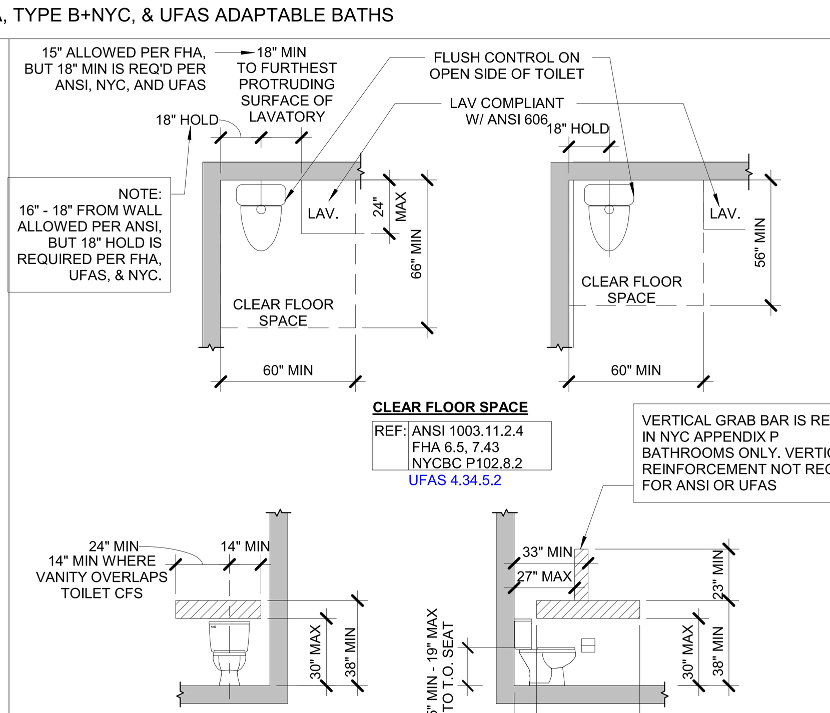


AREAS FOR INSTALLATION OF PROTRUDING TOILET PAPER DISPENSER

REF: ANSI 604.7
NYC P102.8.6
UFAS 4.34.5.2

A2 WATER CLOSET

NTS — @ ANSI TYPE-A, TYPE B+NYC, & UFAS ADAPTABLE BATHS



CLEAR FLOOR SPACE

REF: ANSI 1003.11.2.4
FHA 6.5, 7.43
NYCBC P102.8.2
UFAS 4.34.5.2

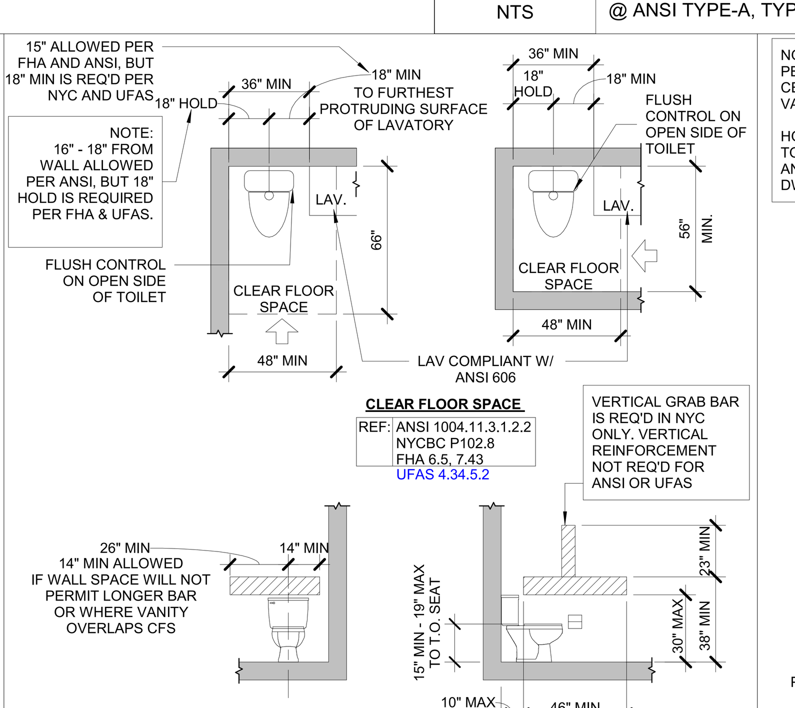
VERTICAL GRAB BAR IS REQ'D IN NYC APPENDIX P BATHROOMS ONLY. VERTICAL REINFORCEMENT NOT REQ'D FOR ANSI OR UFAS

REINFORCED AREAS FOR INSTALLATION OF GRAB BARS

REF: ANSI 604.4, .5, 1003.11.1
NYCBC P102.8.3
FHA 6.3, 6.4
UFAS 4.34.5.2

A6 WATER CLOSET

NTS — @ ANSI TYPE-B, TYPE B+NYC, AND UFAS ADAPTABLE BATHS



CLEAR FLOOR SPACE

REF: ANSI 1004.11.3.1.2.2
NYCBC P102.8
FHA 6.5, 7.43
UFAS 4.34.5.2

VERTICAL GRAB BAR IS REQ'D IN NYC APPENDIX P BATHROOMS ONLY. VERTICAL REINFORCEMENT NOT REQ'D FOR ANSI OR UFAS

NOTE: DIMENSIONS INCLUDE 2" ON ALL SIDES OF GRAB BARS.

REINFORCED AREAS FOR INSTALLATION OF GRAB BARS

REF: ANSI 1004.11.1
NYCBC P102.8.3
FHA 6.3, 6.4

UFAS DOES NOT ALLOW A REDUCED LENGTH SIDE GRAB BAR

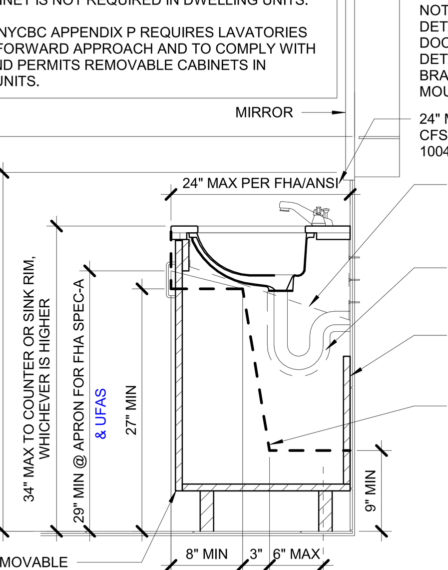
A10 REMOVEABLE VANITY

NTS — @ ADAPTABLE BATHS

NOTE:
PER FHA AND ANSI TYPE-B, IF A PARALLEL APPROACH, CENTERED ON BASIN, IS PROVIDED, A REMOVABLE VANITY CABINET IS NOT REQUIRED IN DWELLING UNITS.

HOWEVER, NYCBC APPENDIX P REQUIRES LAVATORIES TO HAVE A FORWARD APPROACH AND TO COMPLY WITH ANSI 606, AND PERMITS REMOVABLE CABINETS IN DWELLING UNITS.

NOTE: REFER TO VANITY DETAILS ELSEWHERE IN THE DOCUMENTS FOR SPECIFIC DETAILING VANITY SUPPORT BRACKET DESIGN MOUNTING REQUIREMENTS.



REMOVABLE VANITY CABINET

REF: ANSI 1003.11.2.2, 1004.11.3.1.1
NYCBC P102.6, P102.7
FHA 7.52
UFAS 4.19, 4.34.5.3

A13 LAUNDRY EQUIPMENT

NTS — IN TYPE B+NYC DWELLING UNITS AND COMMON AREAS

GENERAL NOTES

TOP LOADING MACHINES ARE NOT PERMITTED PER 2014 NYCBC & UFAS

NYCBC SCOPE FOR PUBLIC AND COMMON AREAS:
- IF THERE ARE 3 OR FEWER WASHING MACHINES AND DRYERS PROVIDED, 1 MUST BE ACCESSIBLE.
- IF THERE ARE MORE THAN 3 MACHINES, 2 MUST BE ACCESSIBLE.

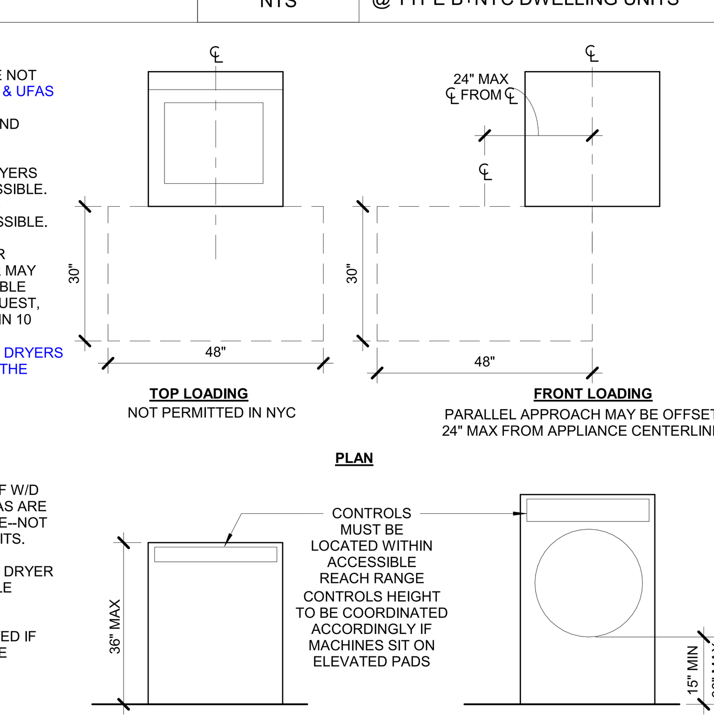
WITHIN DWELLING UNITS, PER NYCBC, WASHER AND DRYER MAY BE REPLACED WITH ACCESSIBLE MODELS AT RESIDENT'S REQUEST, AT OWNER'S EXPENSE, WITHIN 10 DAYS.
IN UFAS UNITS, WASHER AND DRYERS MUST BE ACCESSIBLE FROM THE START.

NOTE:

- ONLY ONE OF EACH TYPE OF W/D APPLIANCE IN COMMON AREAS ARE REQUIRED TO BE ACCESSIBLE--NOT THOSE WITHIN DWELLING UNITS.

- TOP LOADING WASHER AND DRYER ARE PERMITTED IF ADAPTABLE DEVICES ARE PROVIDED.

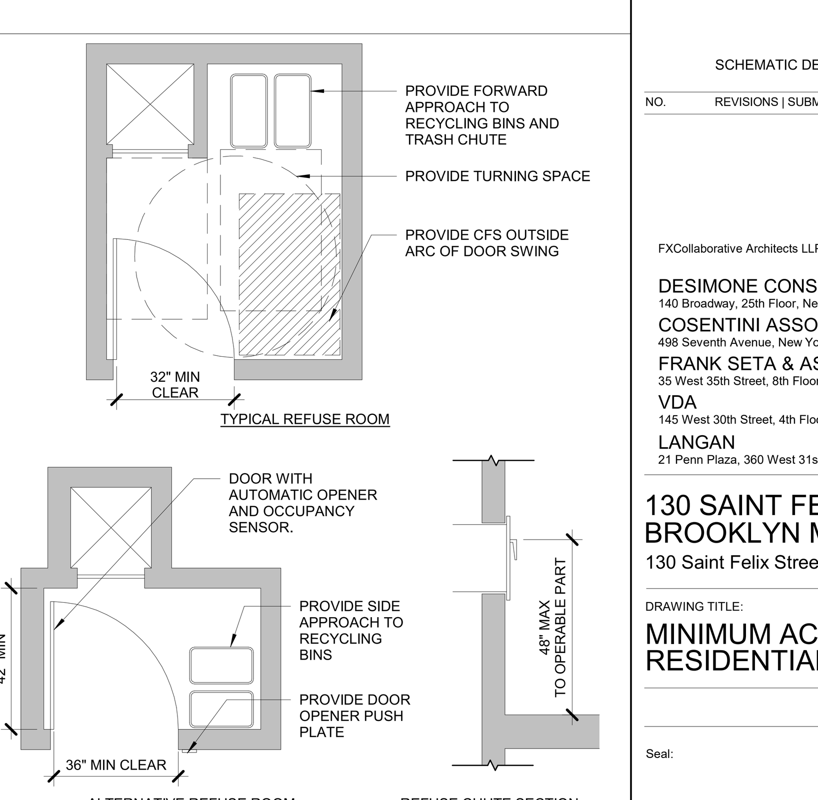
- STACKED W/D ARE PERMITTED IF LOADING AND CONTROLS ARE LOCATED 54" AFF.



REF: ANSI 611
FHA 2.26, 7.19
NYC 1107.2.8, E105.2
UFAS 4.34.7

A18 REFUSE ROOM

NTS



ALTERNATIVE REFUSE ROOM

REF: ANSI 305
NYC BULLETIN 2019-001

REFUSE CHUTE SECTION

REF: ANSI 305, 309

NO.	REVISIONS | SUBMISSIONS	DATE
	SCHEMATIC DESIGN	03.02.2022

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Date: 10/07/20
Scale: As indicated
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Drawing No.: A-007.00

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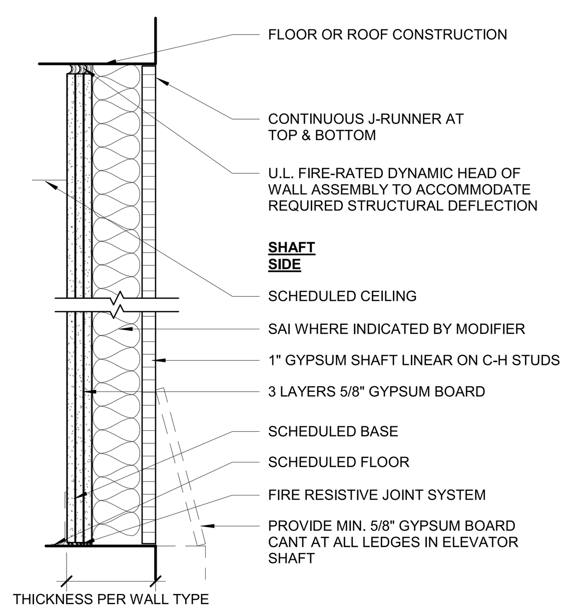
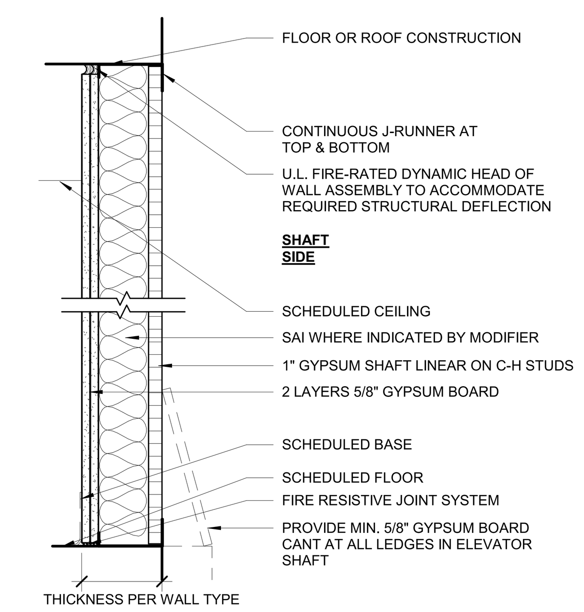


WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE X

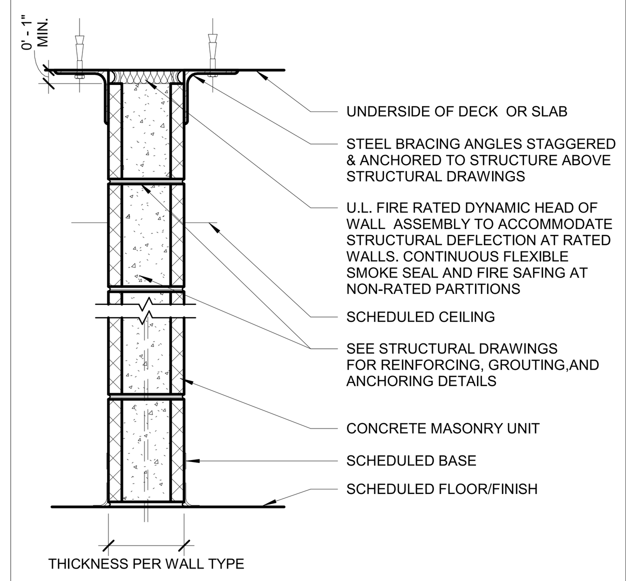
TRIPLE LAYER SHAFT WALL



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE S

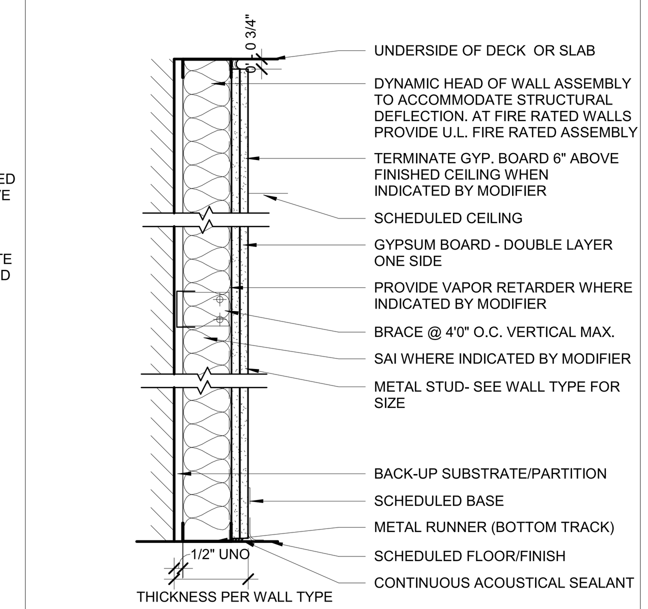
DOUBLE LAYER SHAFT WALL



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE M

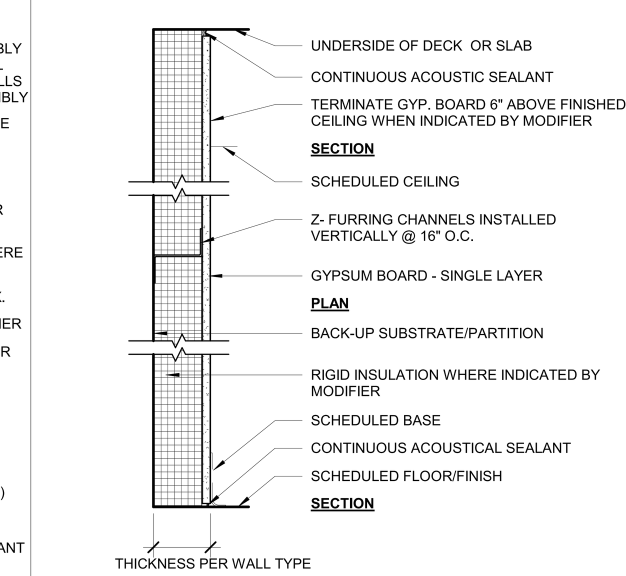
CMU



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE H

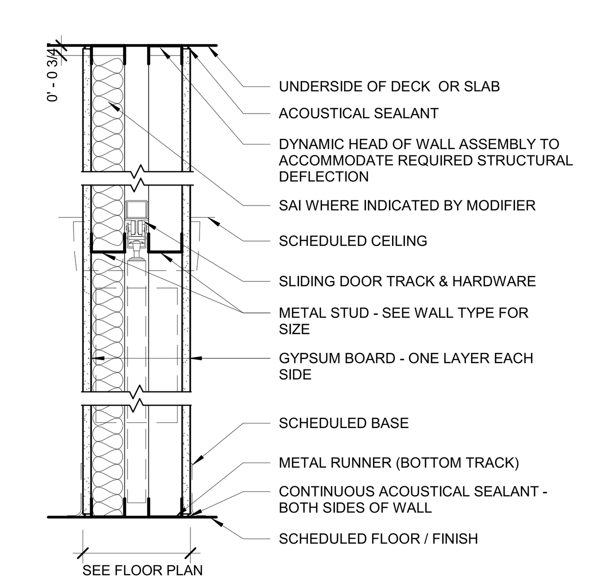
METAL STUD FURRING / DOUBLE LAYER GYP. BD.



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE D

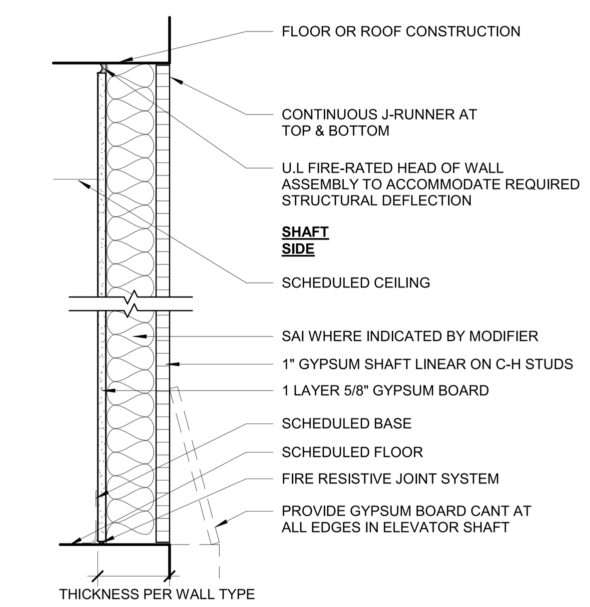
Z - FURRING / GYPSUM BOARD



WALL	DIMENSION	FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE W

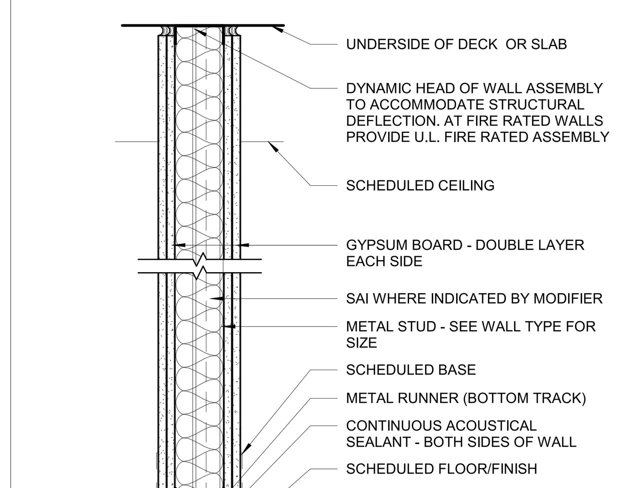
SLIDING POCKET DOOR



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE R

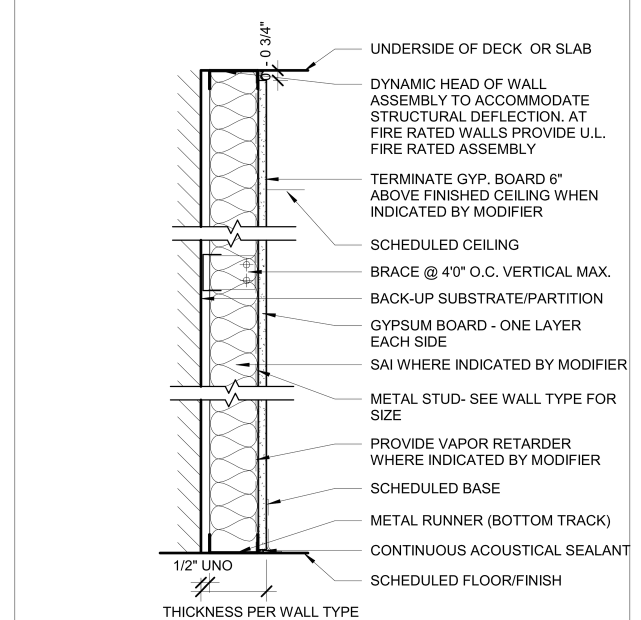
SINGLE LAYER SHAFT WALL



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE L

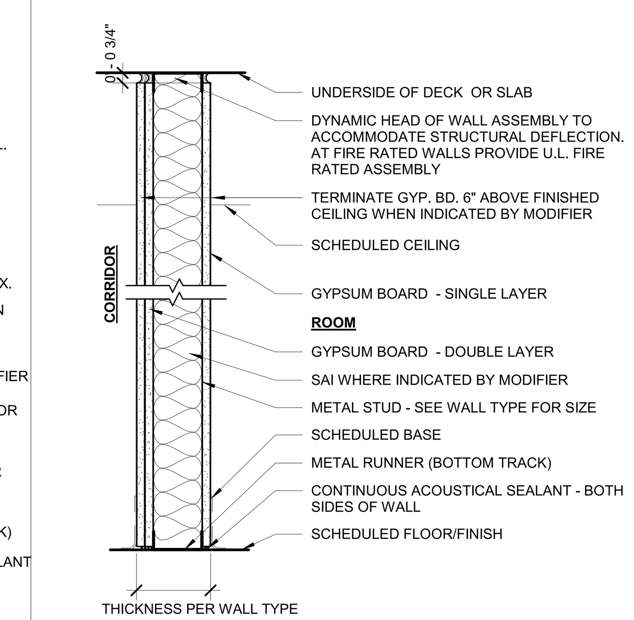
STAGGERED DOUBLE - STUD



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE G

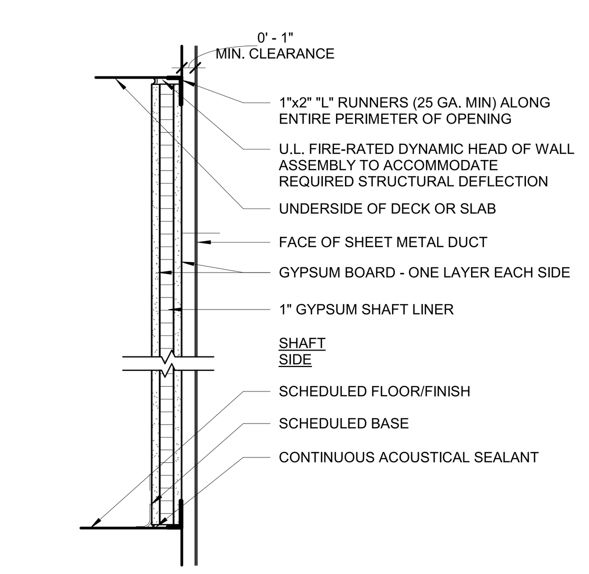
METAL STUD FURRING / GYPSUM BOARD



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE C

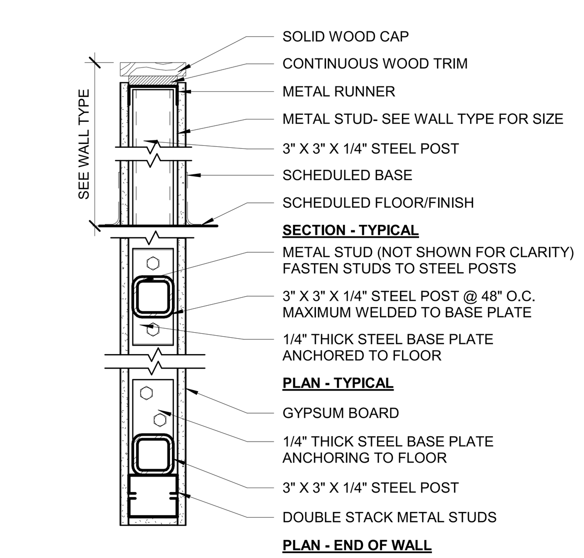
DOUBLE LAYER GYPSUM BOARD ON ONE SIDE



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE V

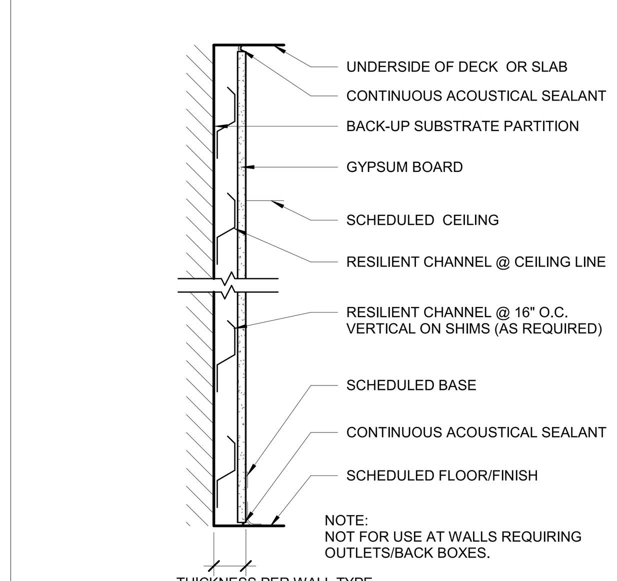
2 HOUR RATED STUDLESS SHAFTWALL



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE P

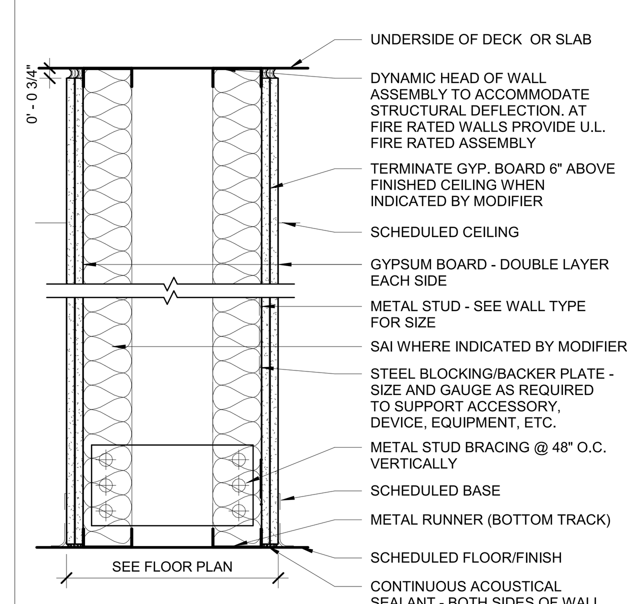
PARTIAL HEIGHT METAL STUD / GYPSUM BOARD



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE K

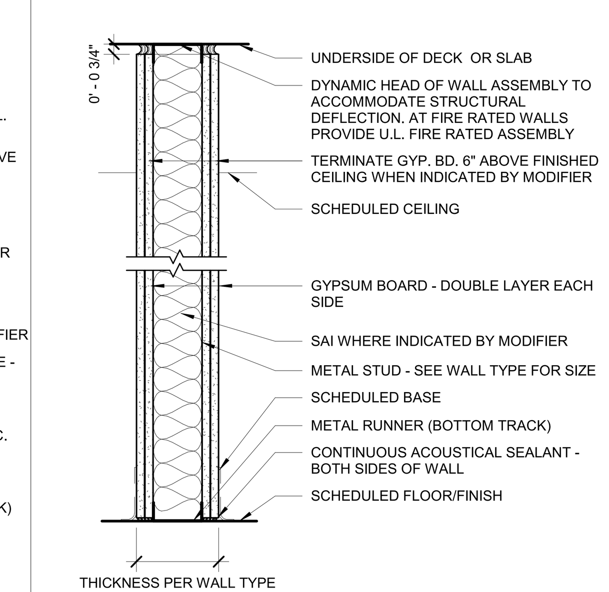
RESILIENT FURRING / GYPSUM BOARD



WALL	DIMENSION	FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE F

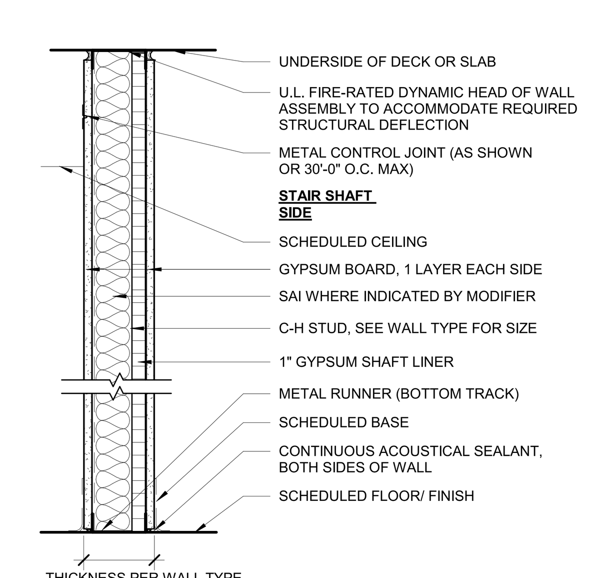
BRACED CHASE W/ DOUBLE LAYER GYP. BD.



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE B

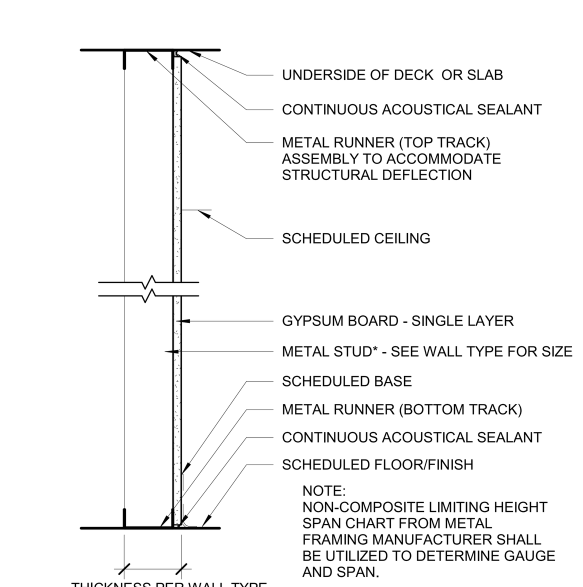
DOUBLE LAYER GYPSUM BOARD



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE T

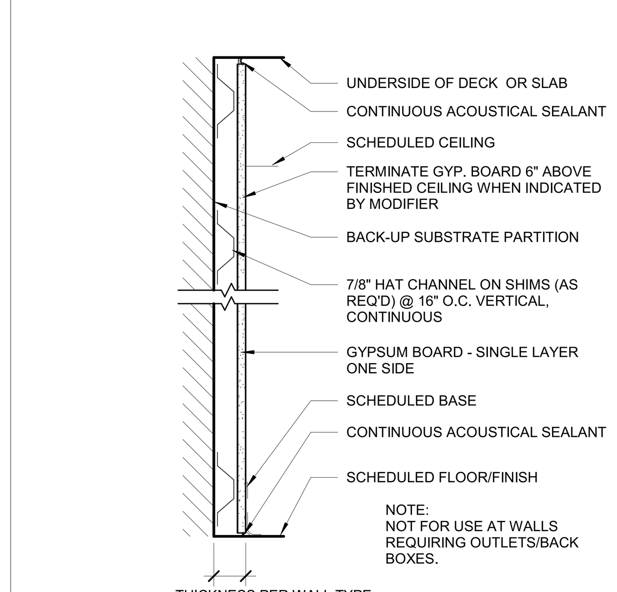
SHAFTWALL PARTITION FINISH BOTH SIDES



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE N

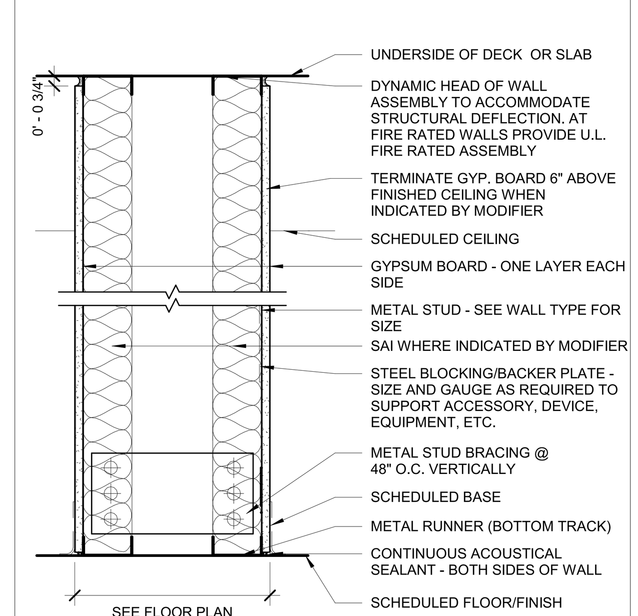
METAL STUD / GYPSUM BOARD ONE SIDE



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE J

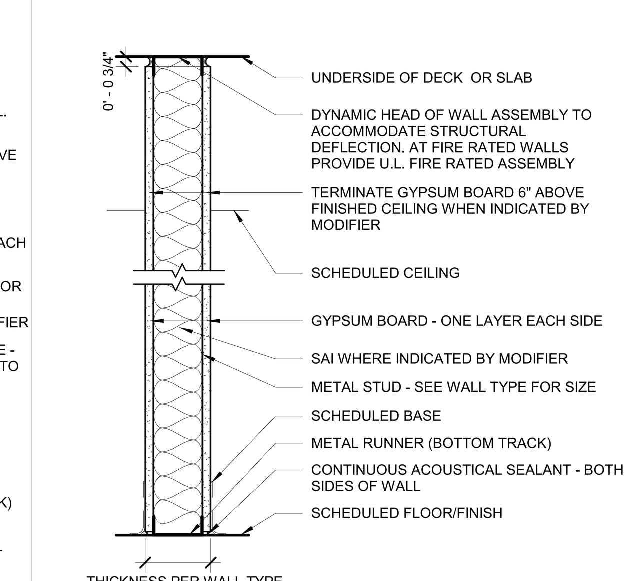
HAT CHANNEL FURRING / GYPSUM BOARD



WALL	DIMENSION	FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE E

BRACED CHASE



WALL	DIMENSION		FIRE RATING		ACOUSTIC RATING		REMARKS
TYPE	OVERALL	STUD	HOUR	DESIGN #	STC	Test #	

PARTITION TYPE A

GYPSUM BOARD

TYPICAL GYP BD PARTITION NOTES

1. GYP BD SHALL BE 5/8" THICK U.N.O.

2. TYPE "X" GYP BD AT ALL FIRE-RATED ASSEMBLIES UNLESS ASSEMBLY DESIGN REQUIRES OTHERWISE

3. STUD SPACING 16" O.C. U.N.O. REFER TO LIMITING HEIGHT SCHEDULE ON THIS SHEET FOR MAXIMUM SPANS & MINIMUM FRAMING METAL THICKNESS.

4. PARTITIONS (STUDS & ALL LAYERS OF GYP BD) TO EXTEND FULL HEIGHT TO UNDERSIDE OF FLOOR OR ROOF ABOVE U.N.O.

5. PROVIDE U.L FIRE RATED DYNAMIC HEAD-OF-WALL ASSEMBLY (HW-D-XXXX) TO ACCOMMODATE REQUIRED STRUCTURAL DEFLECTION AT ALL FULL HEIGHT FIRE RATED PARTITIONS.

6. PROVIDE U.L. FIRE RATED BOTTOM OF WALL ASSEMBLY (BW-S-XXXX) AT ALL FIRE RATED WALLS & SHAFTWALLS.

7. PROVIDE FIRE-RATED CONTROL JOINTS WHEN REQUIRED AT FIRE RATED PARTITIONS.

8. PROVIDE DYNAMIC HEAD-OF-WALL DEFLECTION ASSEMBLY TO ACCOMMODATE REQUIRED STRUCTURAL DEFLECTION AT ALL FULL HEIGHT NON-RATED PARTITIONS. PROVIDE ACOUSTICAL SEALANT AT BOTH SIDES OF WALL.

9. PROVIDE THE FOLLOWING EXPOSED FACE OR CONCEALED LINER PANEL TYPES AT THE NOTED LOCATIONS WHETHER OR NOT INDICATED BY MODIFIER:

a. MOISTURE AND MOLD RESISTANT (MMR) GWB & SHAFT WALL LINER PANELS AT LIMITED-WATER & MOISTURE EXPOSURE AREAS INCLUDING THE INSIDE OF PERIMETER ENCLOSURE WALLS; BELOW-GRADE FLOORS; SHAFT ENCLOSURES; PLUMBING CHASES; STAIR ENCLOSURES; ELEVATOR HOISTWAYS; M/P/FP ROOMS; JC's; KITCHENS & PANTRIES; REFUSE STORAGE; RESTROOM, BATHROOM, POWDER ROOMS & LAUNDRY AREA CEILINGS; & SIM ROOMS AND AREAS.

b. WATER-RESISTANT (WR) TILE BACKER BOARD (TBB) AT LIMITED-WATER & MOISTURE EXPOSURE AREAS INCLUDING FULL-HEIGHT TILE WALLS IN RESTROOMS, BATHROOMS, POWDER ROOMS, JC's, LAUNDRY AREAS & SIM ROOMS WITH PLMB FIXTURES & EQUIPT.

c. FIBER REINFORCED WATER-RESISTANT (WR) TILE BACKER BOARD (TBB) AT PARTIAL-HEIGHT TILE WALLS IN ABOVE NOTED AREAS LISTED IN NOTE (b) SCHEDULED TO RECEIVE PAINT FINISH ABOVE WALL TILE.

d. CEMENTITIOUS BACKER UNIT PANELS (CBU AKA CEMENT BOARD) IN WET EXPOSURE AREAS INCLUDNG SHOWER & TUB WALLS; COMMERCIAL KITCHEN WALLS; PLENUMS; SIM ROOMS & AREAS; & WHERE ADHESIVE INSTALLED STONE TILE FINISH IS SCHEDULED.

10. PROVIDE CONTINUOUS 10" WIDE 14GA. STEEL BACKER PLATE AS REQUIRED AT TOILET ACCESSORIES.

TYPICAL CMU PARTITION NOTES

1. PARTITIONS TO EXTEND FULL HEIGHT TO UNDERSIDE OF FLOOR OR ROOF ABOVE U.N.O

2. PROVIDE ACOUSTICAL SEALANT & BACKER ROD AT HEAD & CONTROL JOINTS IN NON-RATED PARTITIONS. HEAD JOINT DESIGN TO ACCOMMODATE REQUIRED STRUCTURAL DEFLECTION.

3. PROVIDE U.L. FIRE-RATED DYNAMIC HEAD-OF-WALL & CONTROL JOINTS ASSEMBLIES AT ALL FIRE-RATED PARTITIONS.

4. ALL CMU TO BE LIGHTWEIGHT U.N.O.

5. FIRE RATING TO BE BASED UPON EQUIVALENT THICKNESS METHOD PER THE BUILDING CODE.

6. PROVIDE HEAD-OF-WALL SEISMIC RESTRAINT AT ALL FULL HEIGHT PARTITIONS. SEE STRUCTURAL DRAWING FOR ADDITIONAL INFORMATION.

INTERIOR FRAMING LIMITING HEIGHT SCHEDULE (33 KSI)

SIZE	METAL THICKNESS	SPACING	LIMITING HEIGHT @ 5PSF	
			L/240	L/360
2 1/2"	.0269 (22 GA)	16" O.C.	13' - 11"	12' - 5"
2 1/2"	.033 (20 GA)	16" O.C.	14' - 5"	12' - 10"
3 5/8"	.0269 (22 GA)	16" O.C.	16' - 6"	14' - 5"
3 5/8"	.033 (20 GA)	16" O.C.	16' - 7"	14' - 10"
4"	.033 (20 GA)	16" O.C.	17' - 8"	15' - 5"
6"	.0269 (22 GA)	16" O.C.	24' - 4"	21' - 3"
6"	.033 (20 GA)	16" O.C.	24' - 7"	21' - 6"

NOTES:

1. SCHEDULE BASED UPON INTERIOR NON-STRUCTURAL COMPOSITE WALL SHEATHING INSTALLED FULL HEIGHT- BOTH SIDES. WHERE SHEATHING IS NOT INSTALLED FULL HEIGHT ON BOTH SIDES, NON-COMPOSITE LIMITING HEIGHTS SHALL BE UTILIZED. REFER TO STUD MANUFACTURER'S LIMITING HEIGHTS INFORMATION.

2. L/240 FOR SUBSTRATES WITH FLEXIBLE FINISH INCLUDING PAINT
L/360 FOR SUBSTRATES WITH RIGID FINISHES INCLUDING PLASTER & TILE

3. STUD SPACING @16"O.C. TYPICAL INCLUDING AT STC-RATED PARTITIONS, U.N.O.

4. WHERE KNEE-BRACING IS REQUIRED TO MEET SPAN LIMITATIONS, PROVIDE DIAGONAL METAL STUD KICKERS AT EVERY OTHER STUD. ATTACH TO STRUCTURE ABOVE WITH CLIP ANGLES OR CONTINUOUS METAL CHANNEL.

C-H FRAMING LIMITING HEIGHTS SCHEDULE

SIZE	METAL THICKNESS	SPACING	LIMITING HEIGHT @ 5PSF	
			L/240	L/360
2 1/2" C-H	.0179 (25 GA)	24" O.C.	11' - 2"	9' - 10"
2 1/2" C-H	.033 (20 GA)	24" O.C.	12' - 3"	10' - 10"
4" C-H	.0179 (25 GA)	24" O.C.	15' - 2"	13' - 4"
4" C-H	.033 (20 GA)	24" O.C.	17' - 6"	15' - 3"
6" C-H	.033 (20 GA)	24" O.C.	21' - 9"	20' - 0"

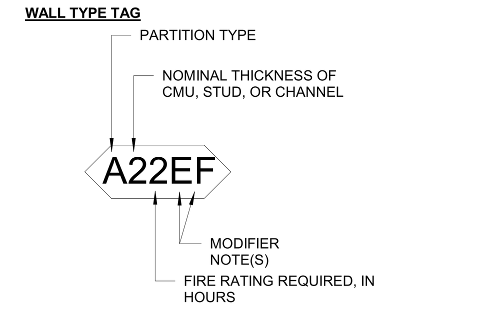
NOTES:

1. REFER TO STUD MANUFACTURER'S LIMITING HEIGHTS INFORMATION FOR STUD SIZES AND GAUGES NOT INDICATED ABOVE.

PARTITION NOTES-GENERAL:

1. ALL PARTITIONS SHOWN IN SECTION U.N.O.

WALL TYPE TAG



PARTITION TYPES

A = GYP BD - 1 LAYER BOTH SIDES
B = GYP BD - 2 LAYERS BOTH SIDES
C = GYP BD - 2 LAYERS ONE SIDE
D = GYP BD - Z FURRING
E = BRACED CHASE, GYP BD
F = BRACED CHASE, DOUBLE GYP BD
G = METAL STUD FURRING, GYP BD
H = METAL STUD FURRING, DOUBLE GYP BD
J = HAT CHANNEL FURRING, GYP BD
K = RESILIENT FURRING, GYP BD
L = STAGGERED DOUBLE STUDS
M = CMU
N = METAL STUD, GYP BD ONE SIDE
P = PARTIAL HEIGHT METAL STUD, GYP BD
R = SHAFT WALL, SINGLE LAYER GYP BD
S = SHAFT WALL, DOUBLE LAYER GYP BD
T = SHAFTWALL, FINISHED BOTH SIDES
V = SHAFTWALL, STUDLESS
W = GYP BD, POCKET DOOR
X = SHAFTWALL, TRIPLE LAYER

NOMINAL THICKNESS OF CMU, STUD, OR CHANNEL

FOR STUD PARTITIONS (EXCEPT Z-FURRING) FLANGE WIDTH IS AS FOLLOWS:
1 = 1 5/8" STUD
2 = 2 1/2" STUD
3 = 3 5/8" STUD
4 = 4" STUD
5 = 1/2" RESILIENT FURRING CHANNEL
6 = 6" STUD
7 = 7/8" HAT-SHAPED FURRING CHANNEL
8 = 8" STUD

FOR Z-FURRING THICKNESS IS AS FOLLOWS:
1 = 1" CHANNEL
2 = 2" CHANNEL
3 = 1.5" CHANNEL
5 = 2.5' CHANNEL

FOR CMU PARTITIONS THICKNESS IS AS FOLLOWS:
1 = 11 5/8" CMU
2 = 1 5/8" CMU
4 = 3 5/8" CMU
6 = 5 5/8" CMU
8 = 7 5/8" CMU
9 = 9 5/8" CMU

FIRE RATING

0 = NO RATING
1 = 1 HOUR
2 = 2 HOURS
3 = 3 HOURS
5 = 0.5 HOUR

MODIFIER NOTES

A = SOUND ATTENUATION INSULATION (SAI) - FULL HEIGHT & THICKNESS U.N.O

B = FACE LAYER AT ROOM SIDE SUBJECT TO MOISTURE TO BE MOISTURE & MOLD-RESISTANT GYP BD.

C = FACE LAYER AT WET WALL (SHOWER, TUB, ETC.) TO BE TILE BACKING BOARD IN LIEU OF GYP BD.

D = RIGID INSULATION FOR FULL THICKNESS OF FURRING OR STUD. TAPE ALL JOINTS BETWEEN RIGID BOARDS.

E = BATT INSULATION FOR FULL THICKNESS OF FURRING OR STUD WITH VAPOR BARRIER ON WARM SIDE. TAPE ALL JOINTS BETWEEN BATTS.

F = ABUSE-RESISTANT GYP BD FACE LAYER IN LIEU OF REGULAR OR TYPE X GYP BD.

G = TERMINATE PARTITION AT UNDERSIDE OF CEILING. TIE TO CEILING GRID OR FRAMING.

H = TERMINATE GYP BD 6" ABOVE FINISHED CEILING.

J = 1/2" GYP BD IN LIEU OF 5/8" GYP BD.

K = MINIMUM 20 GA., 3 5/8" METAL STUD FRAMING W/ ASTM C1629 HARD BODY IMPACT CLASSIFICATION LEVEL 3 GYP. BD. USED AS INNER (BASE) LAYER ON FLOOR SIDE AT STAIR PERIMETER ENCLOSURE WALLS.

M = MINIMUM 20 GA., 4" C-H METAL FRAMING W/ ASTM C1629 HARD BODY IMPACT CLASSIFICATION LEVEL 3 GYP. BD. USED AS INNER (BASE) LAYER ON FLOOR SIDE AT PERIMETER ENCLOSURE WALLS.

N = MINIMUM 20 GA., 3 5/8" METAL STUD FRAMING W/ ASTM C1629 HARD BODY IMPACT CLASSIFICATION LEVEL 3 GYP. BD. USED AS INNER (BASE) LAYER ON FLOOR SIDE AT PERIMETER ENCLOSURE WALLS & AS THE FINISH LAYER AT STAIR SIDE OF STAIR ENCLOSURE WALLS AND THE FINISH LAYER ON BOTH SIDES OF THE SCISSOR STAIR COMMON CENTER WALL.

P = MINIMUM 20 GA., 4" C-H METAL FRAMING W/ ASTM C1629 HARD BODY IMPACT CLASSIFICATION LEVEL 3 GYP. BD. USED ON THE FLOOR SIDE AT STAIR PERIMETER ENCLOSURE WALLS & AS THE FINISH LAYER AT STAIR SIDE OF STAIR ENCLOSURE WALLS AND THE FINISH LAYER ON BOTH SIDES OF THE SCISSOR STAIR COMMON CENTER WALL.

Q = METAL STUD FRAMING (AS SCHEDULED) W/ ASTM C1629 HARD BODY IMPACT CLASSIFICATION LEVEL 3 GYP. BD. USED AS THE FINISH LAYER AT STAIR SIDE OF STAIR ENCLOSURE WALLS AND THE FINISH LAYER ON BOTH SIDES OF THE SCISSOR STAIR COMMON CENTER WALL.

R = C-H METAL FRAMING (AS SCHEDULED) W/ ASTM C1629 HARD BODY IMPACT CLASSIFICATION LEVEL 3 GYP. BD. USED AS THE FINISH LAYER AT STAIR SIDE OF STAIR ENCLOSURE WALLS AND THE FINISH LAYER ON BOTH SIDES OF THE SCISSOR STAIR COMMON CENTER WALL.

S = MINIMUM 20 GA. , 4" C-H METAL FRAMING W/ASTM C1629 HARD BODY IMPACT CLASSIFICATION LEVEL 3 GYP. BD. INSTALLED ON FLOOR SIDE AT PERIMETER ENCLOSURE WALLS.

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NO.	REVISIONS | SUBMISSIONS	DATE
	SCHEMATIC DESIGN	03.02.2022

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DRAWING TITLE:
PARTITION TYPES
TEXT NOTES

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Reviewed:
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Drawing No.: A-008.00
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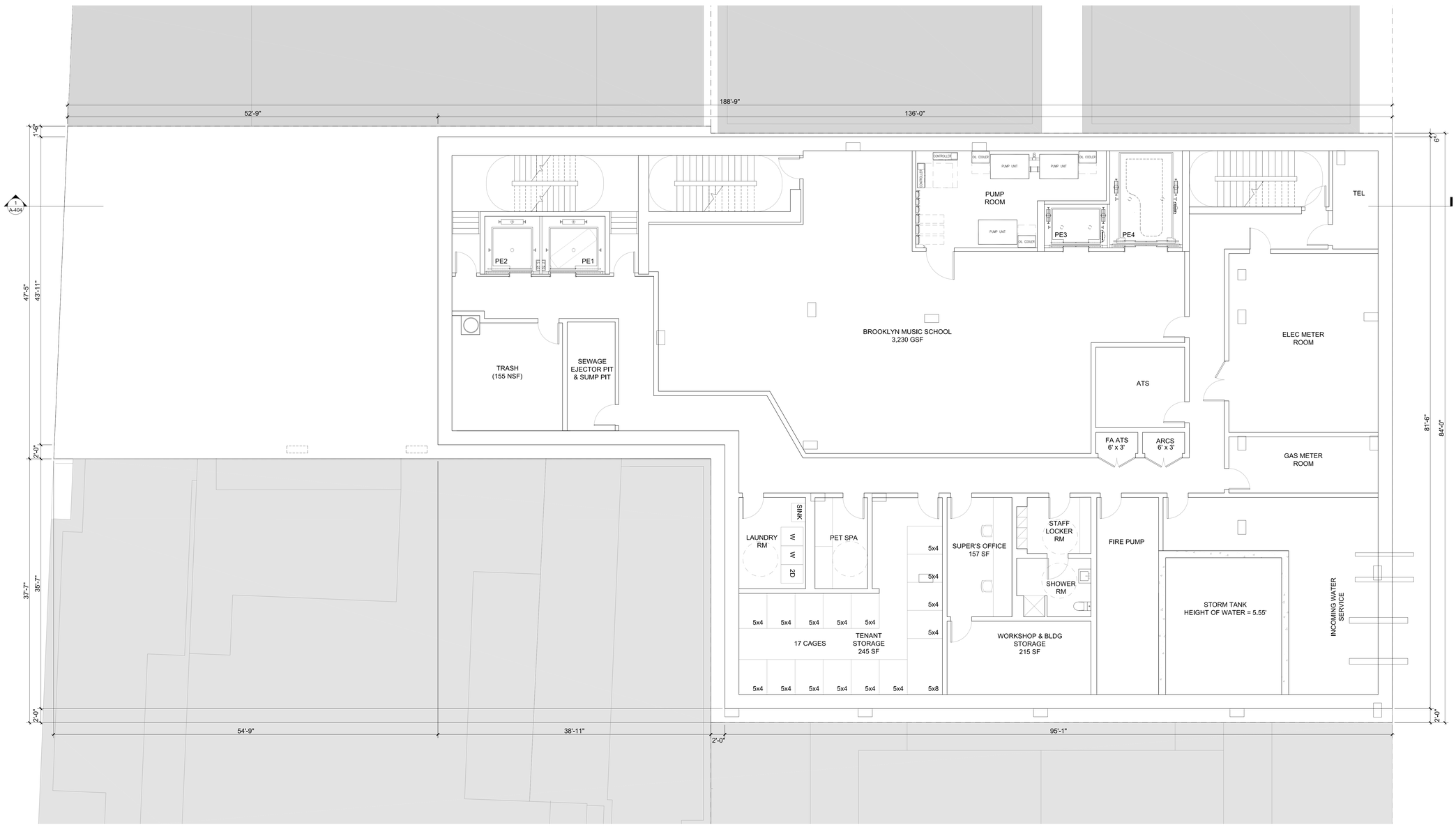

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DRAWING TITLE:
CELLAR FLOOR PLAN

Seal:

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Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-100.00

A1 CELLAR FLOOR PLAN
3/16" = 1'-0"

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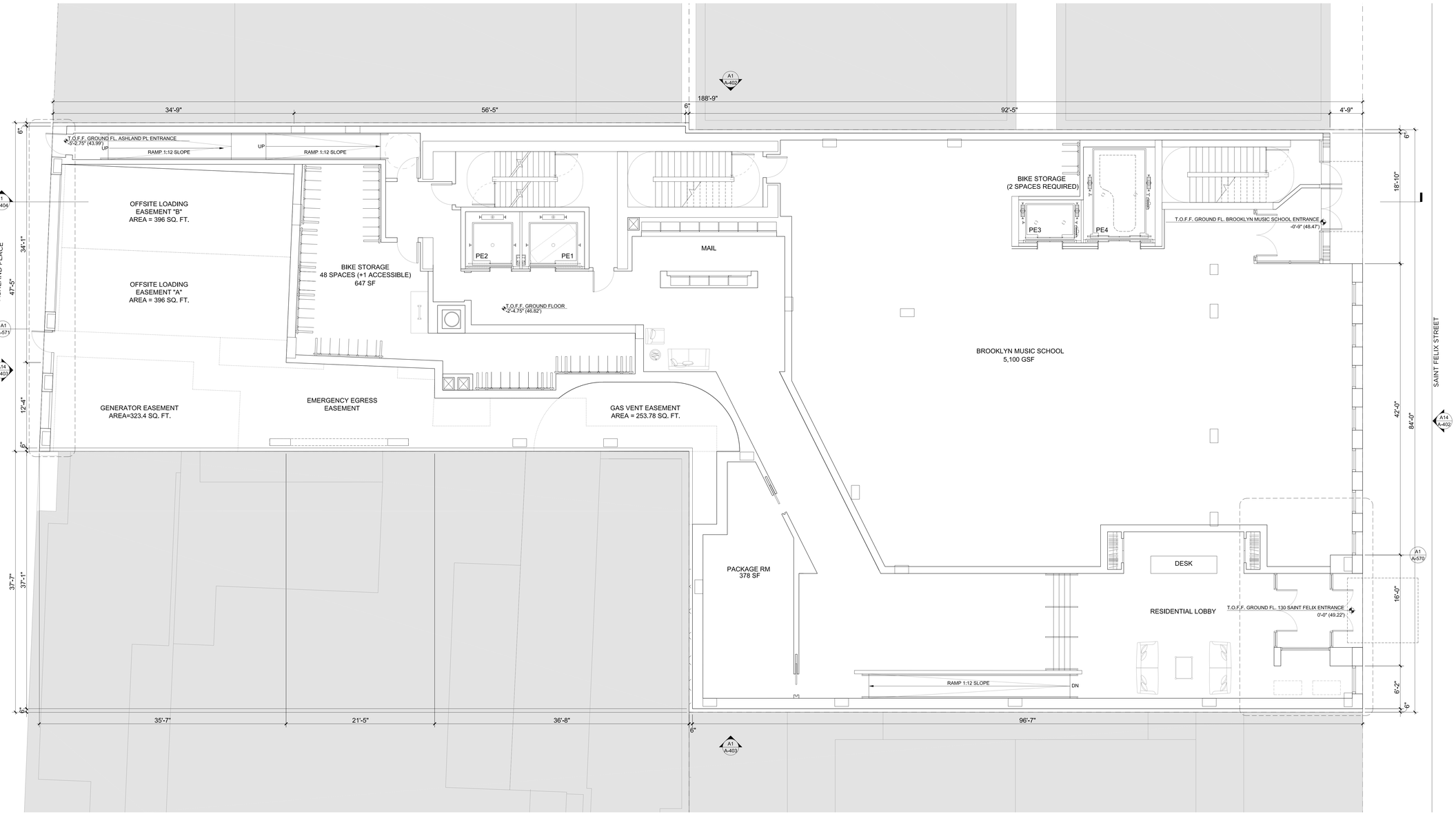

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DRAWING TITLE:
GROUND FLOOR PLAN

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"

Project No.: 180444.L01

Drawing No.: A-101.00

A1 GROUND FLOOR PLAN
3/16"=1'-0"

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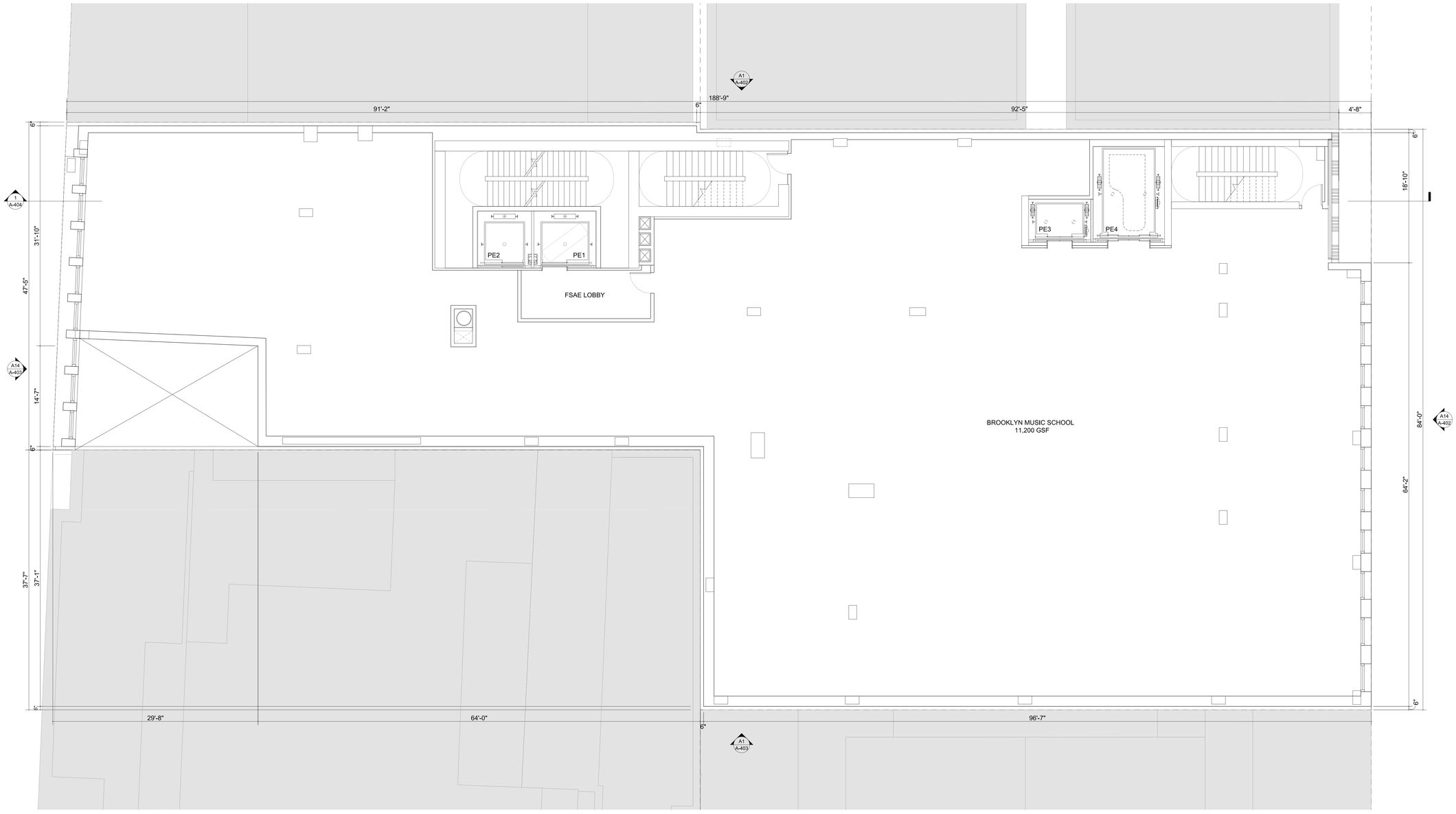

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DRAWING TITLE:
2ND FLOOR PLAN

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"

Project No.: 18044.L01

Drawing No.: A-102.00

A1 2ND FLOOR PLAN
3/16"=1'-0"

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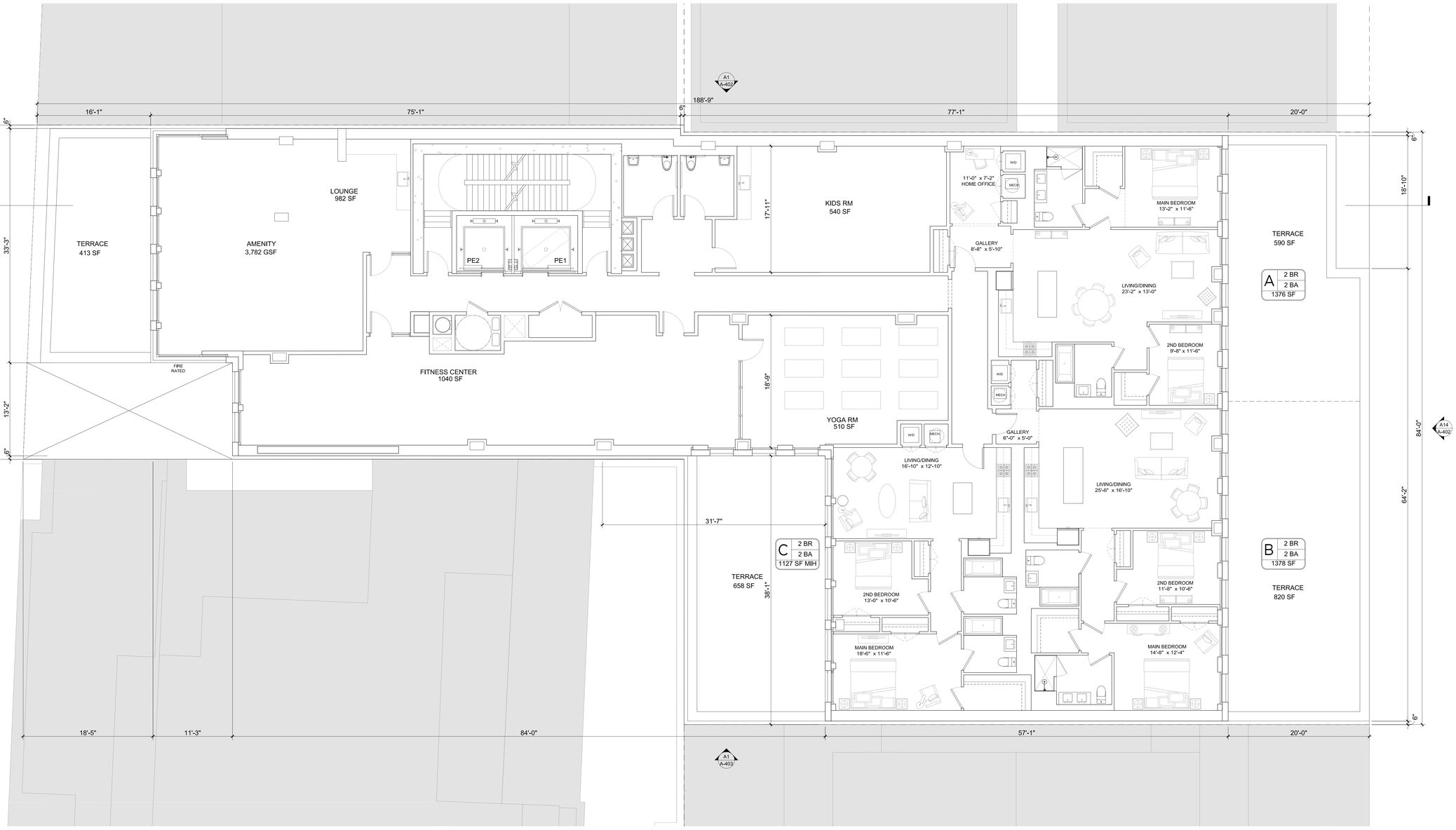

MATERIAL KEYING LEGEND:

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DRAWING TITLE:
3RD FLOOR PLAN

Seal:

Drawn: DRN
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Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-103.00

A1 3RD FLOOR PLAN
3/16"=1'-0"

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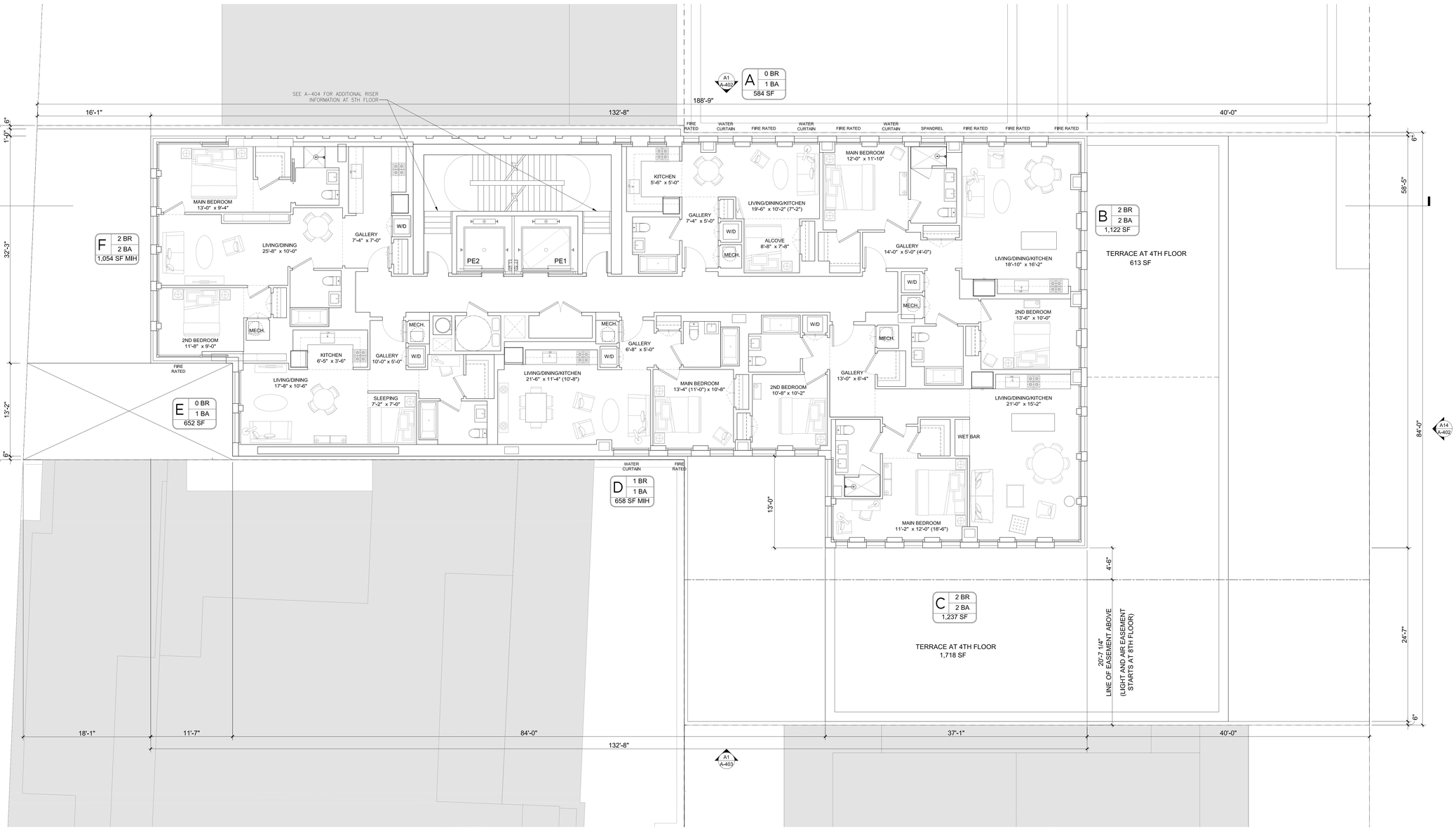

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DRAWING TITLE:
4TH - 5TH FLOOR PLAN

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Date: DATE
Scale: 3/16"=1'-0"

Project No.: 18044.L01

Drawing No.: A-104.00

A1	4TH - 5TH FLOOR PLAN
3/16"=1'-0"	

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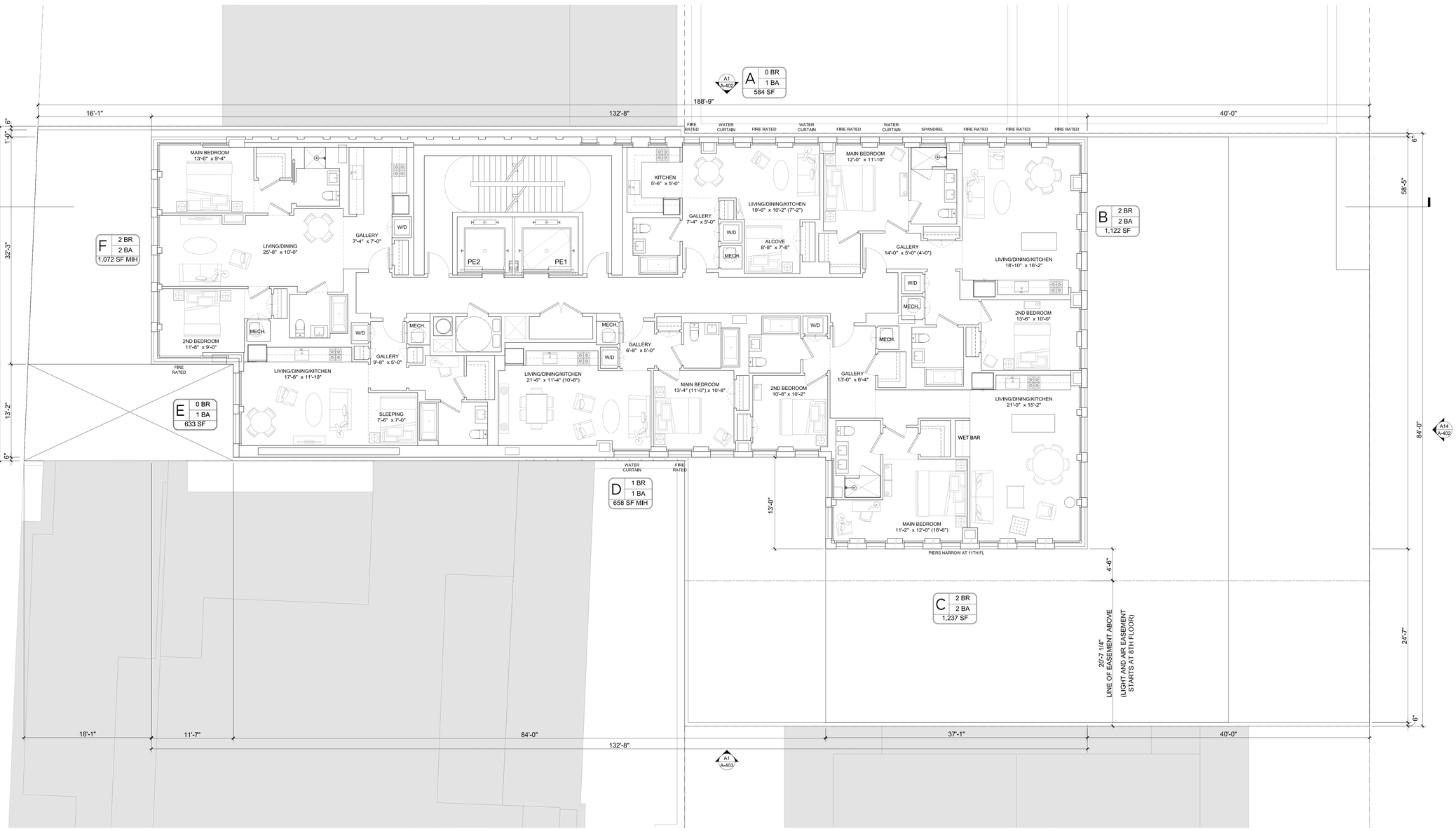

MATERIAL KEYING LEGEND:

GENERAL NOTES:

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DRAWING TITLE:
6TH FLOOR PLAN

Seal:

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Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-106.00

A1	6TH FLOOR PLAN
3/16"=1'-0"	

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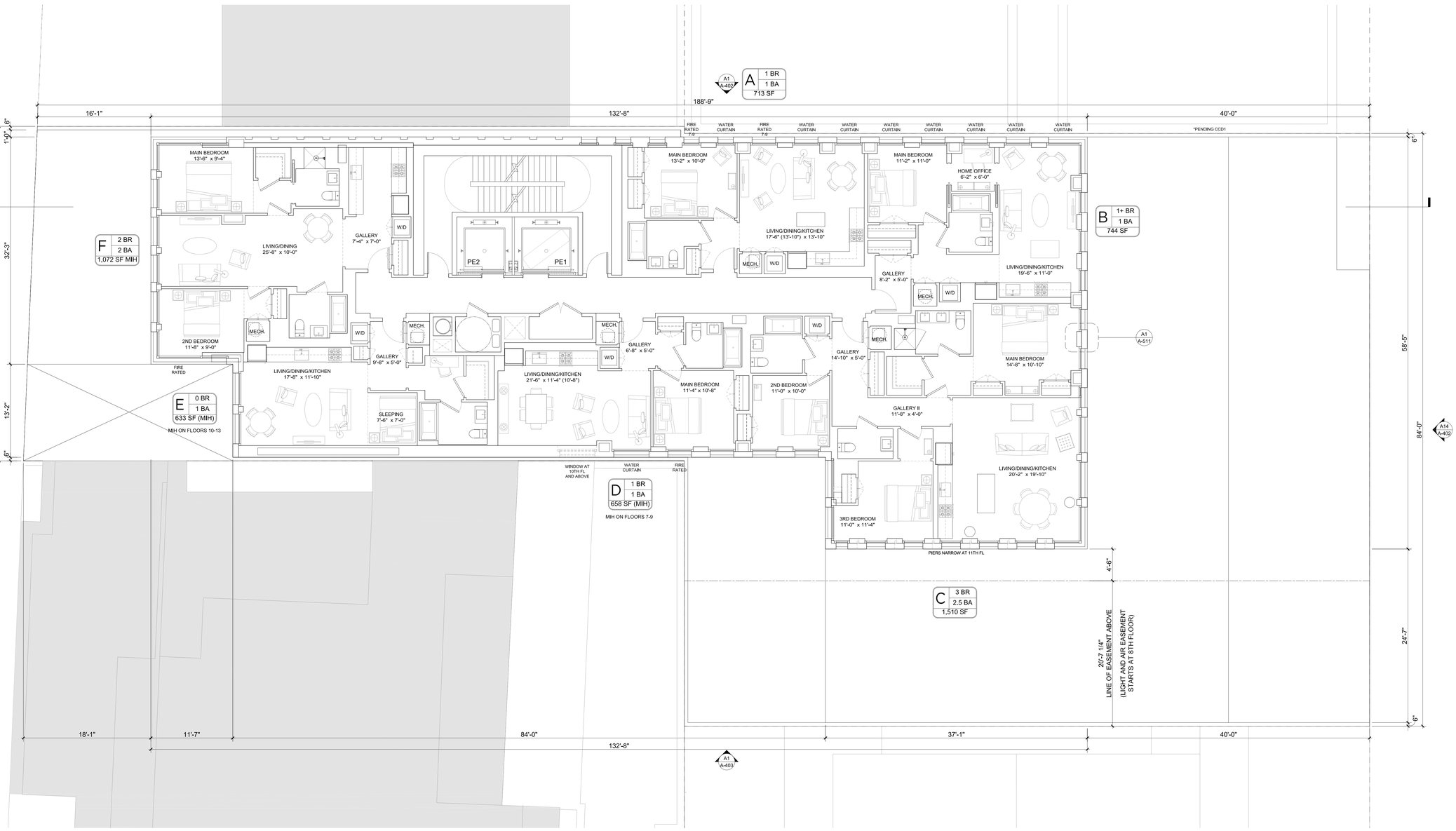

A1	7TH - 13TH FLOOR PLAN
3/16"=1'-0"	

MATERIAL KEYING LEGEND:

GENERAL NOTES:

1. AT MEP TRANSFER FLOORS, GWB CEILINGS ARE TO BE PROVIDED ABOVE INTERIOR SPACES, INCLUDING HALLWAYS, CLOSETS, BATHROOMS, AND KITCHENS.

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DRAWING TITLE:
7TH - 13TH FLOOR PLAN

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-107.00

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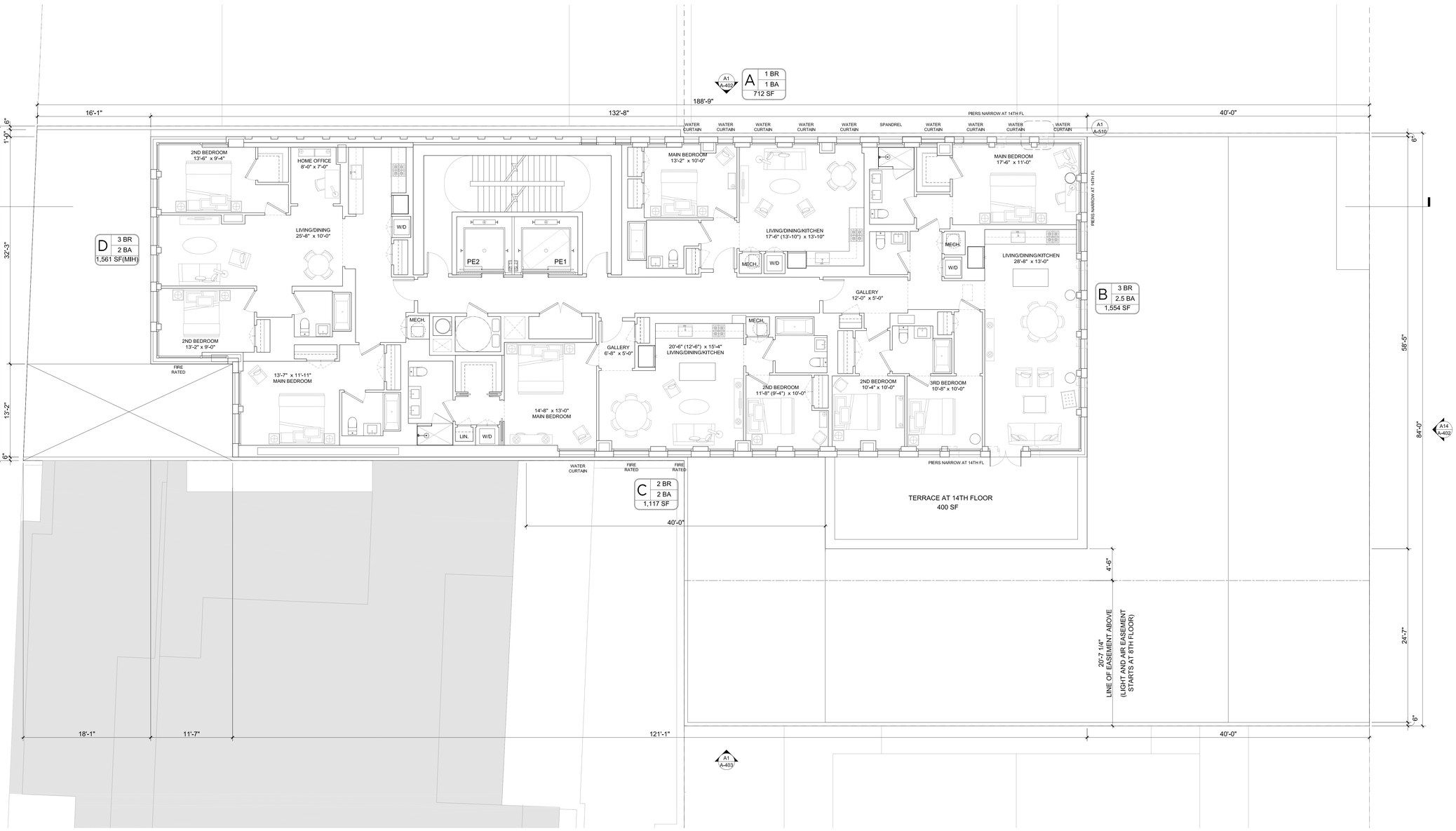

MATERIAL KEYING LEGEND:

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DRAWING TITLE:
14TH - 16TH FLOOR PLAN

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-114.00

A1	14TH - 16TH FLOOR PLAN
3/16"=1'-0"	

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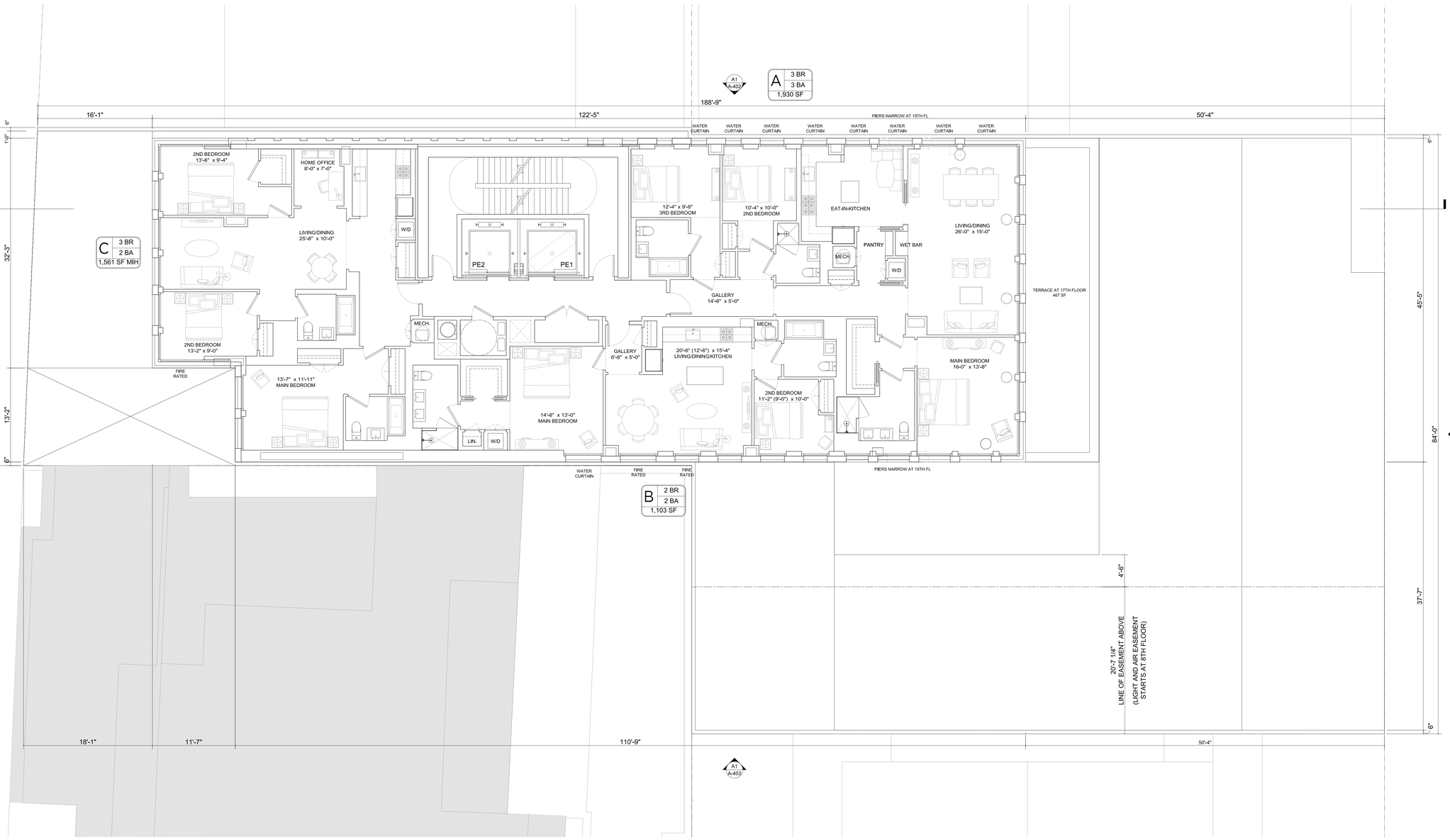

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DRAWING TITLE:
17TH - 19TH FLOOR PLAN

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-117.00

A1	17TH - 19TH FLOOR PLAN
3/16"=1'-0"	

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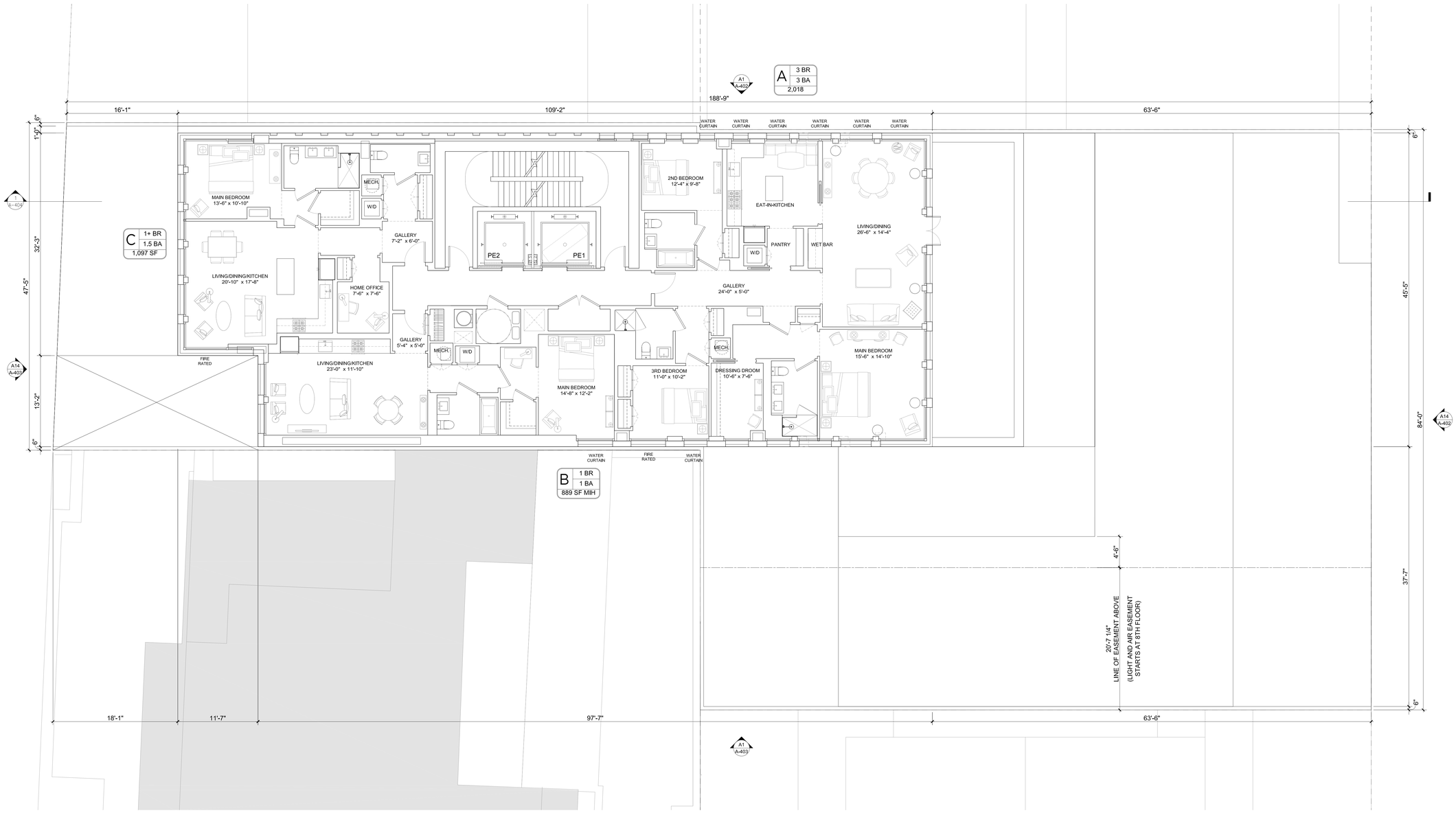

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DRAWING TITLE:

20TH - 22ND FLOOR PLAN

Seal:

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Reviewed: RVD
Date: DATE
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Project No.: 18044.L01

Drawing No.: A-120.00

A1 20TH - 22ND FLOOR PLAN
3/16"=1'-0"

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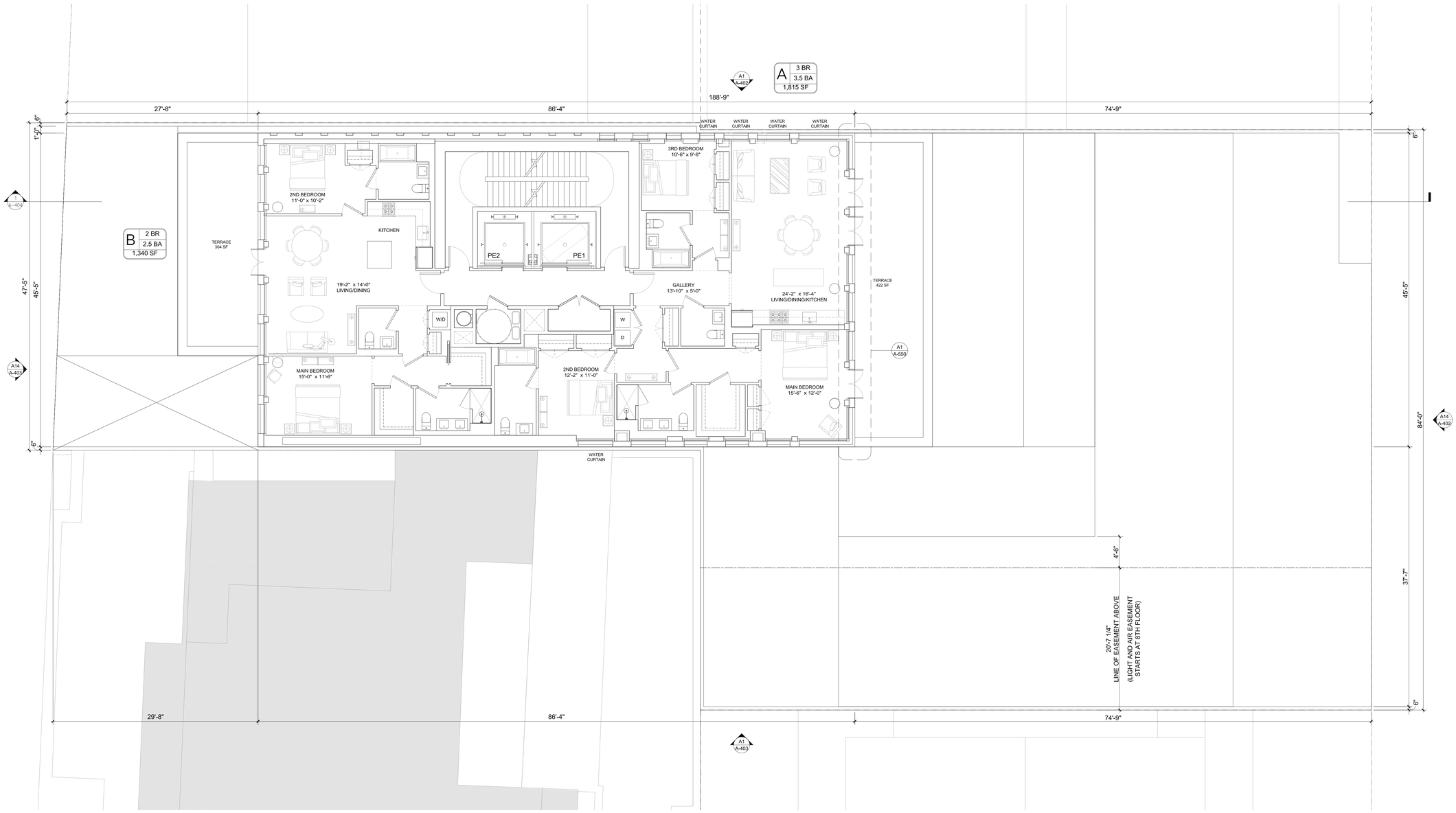

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GENERAL NOTES:

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DRAWING TITLE:
23RD FLOOR PLAN

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
CAD_FILE
Drawing No.: A-123.00

A1 | 23RD FLOOR PLAN
3/16"=1'-0"

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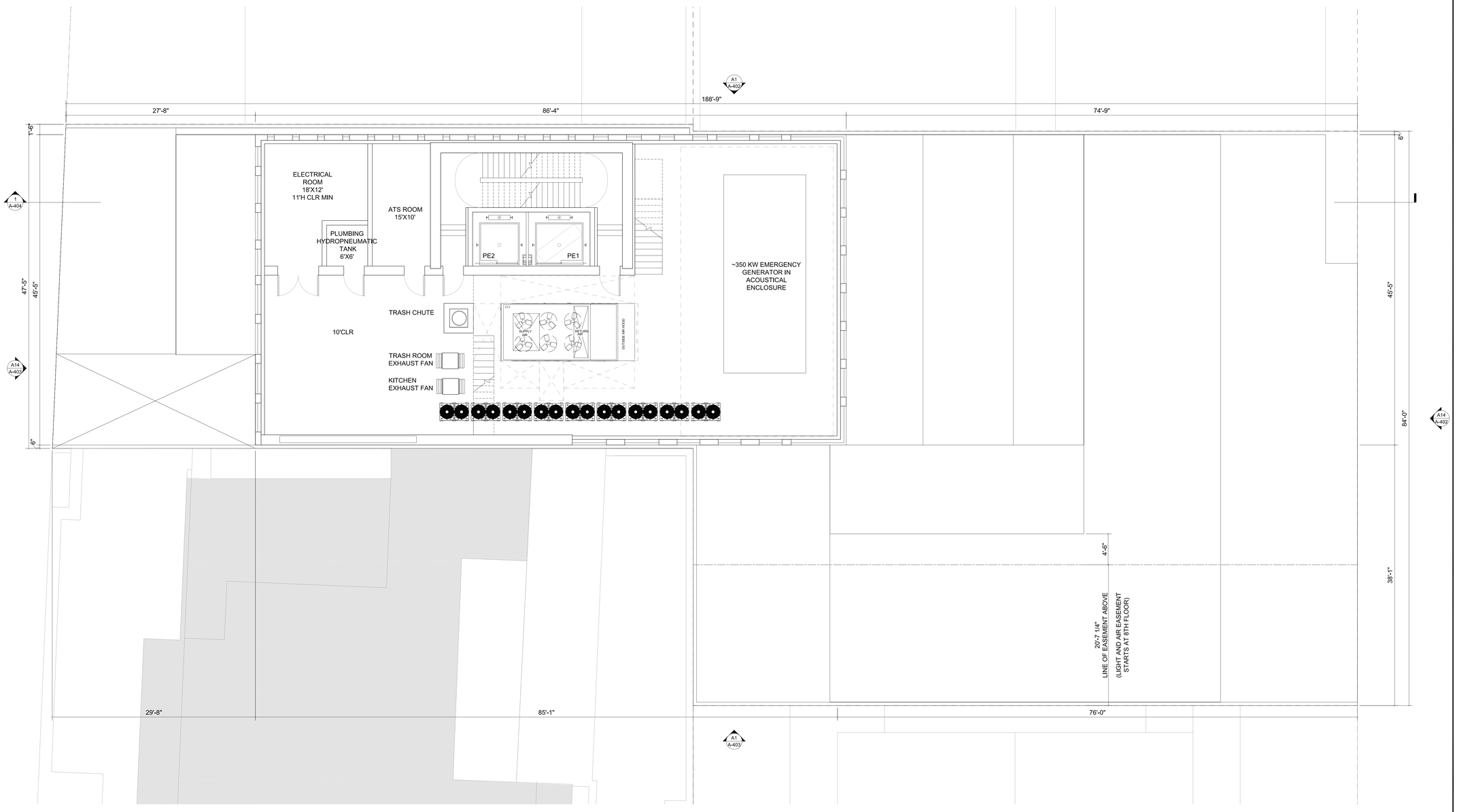

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DRAWING TITLE:
BULKHEAD ROOF PLAN

Seal:

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Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-124.00

A1 BULKHEAD ROOF PLAN
3/16"=1'-0"

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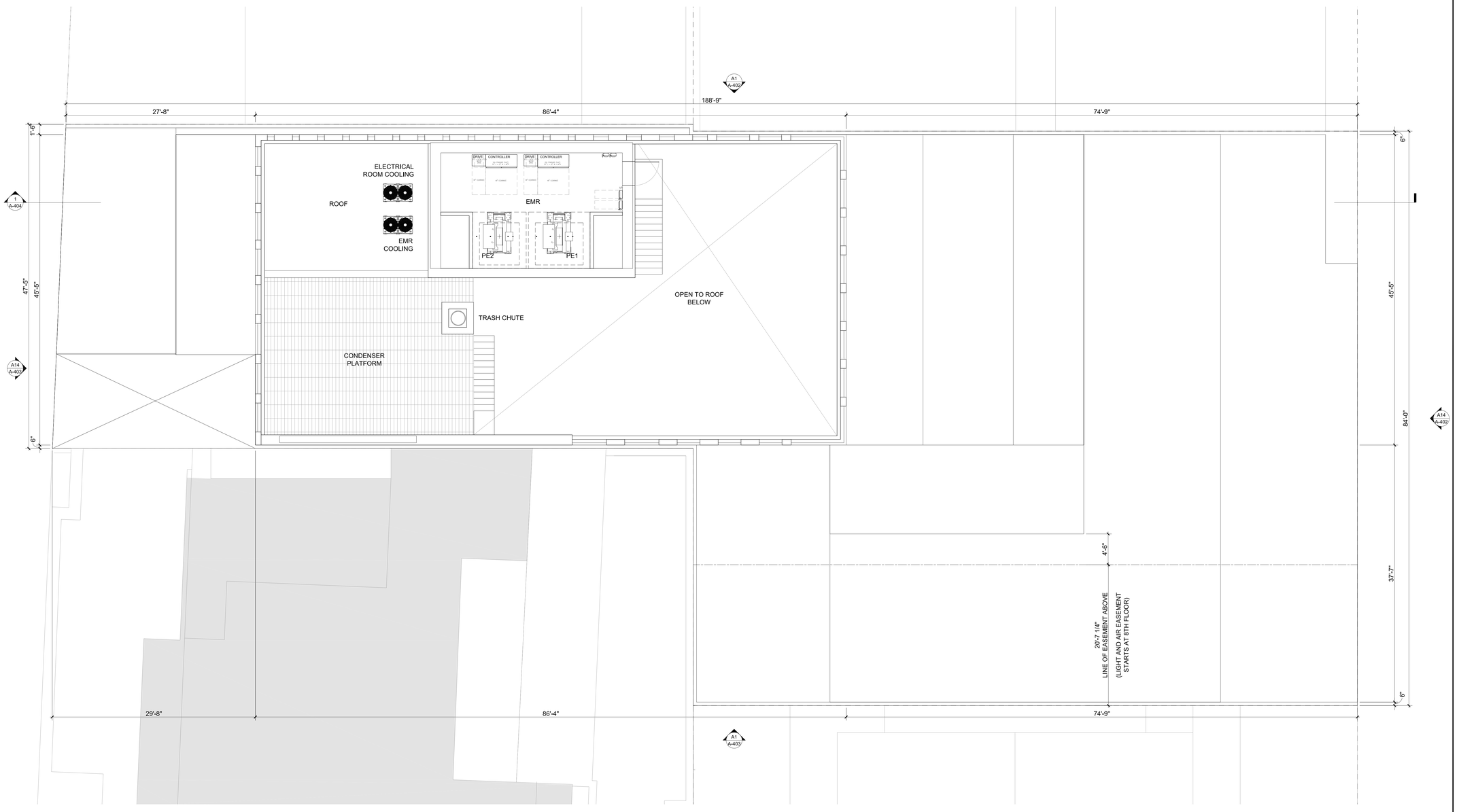

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DRAWING TITLE:
BULKHEAD EMR PLAN

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Reviewed: RVD
Date: DATE
Scale: 3/16"=1'-0"
Project No.: 18044.L01
Drawing No.: A-125.00

A1 BULKHEAD EMR PLAN
3/16"=1'-0"

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L1	ASHLAND PL LOOKING SOUTHEAST
NTS	

L11	ASHLAND PL LOOKING NORTHEAST
NTS	

A1	ST. FELIX ST LOOKING NORTHWEST
NTS	

A11	ST. FELIX ST LOOKING SOUTHWEST
NTS	

MATERIAL KEYING LEGEND:

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DRAWING TITLE:
EXTERIOR RENDERINGS

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Project No.: 18044.L01

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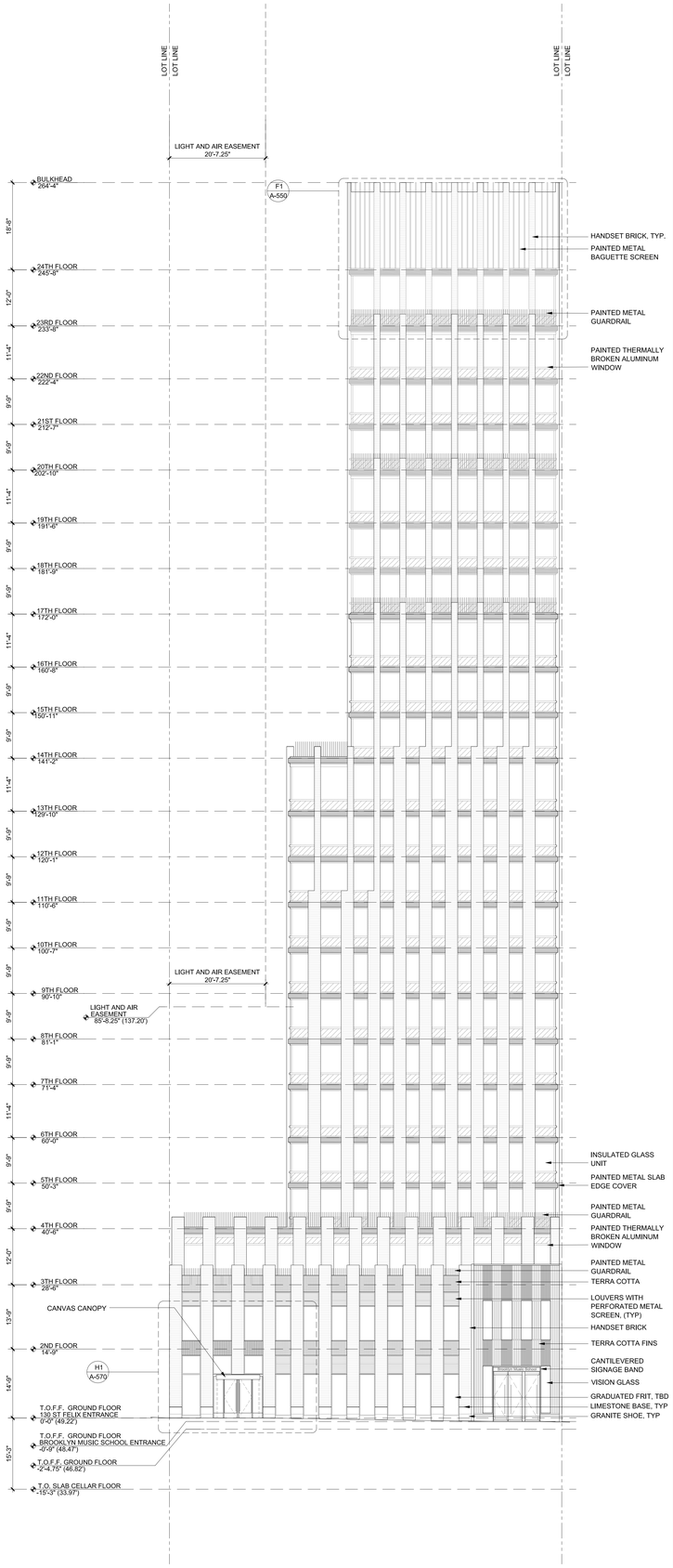

A1 EAST ELEVATION

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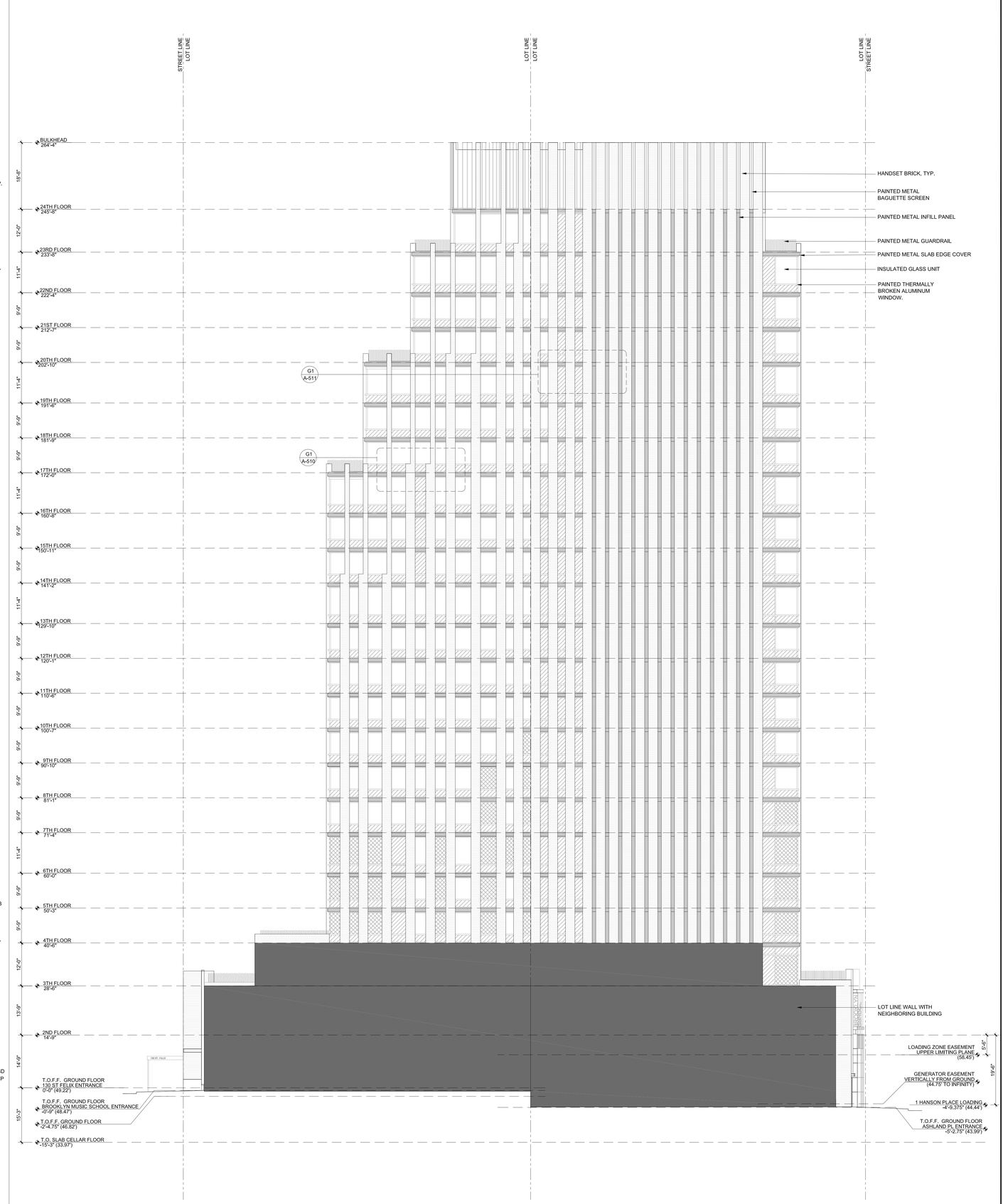

A8 NORTH ELEVATION

3/32" = 1'-0"

MATERIAL KEYING LEGEND:

HATCH LEGEND:

- FIRE RATED WINDOW
- SPANDREL WINDOW
- BRICK
- PAINTED METAL SLAB EDGE COVER
- CMU OR CAST-IN-PLACE CONCRETE WALL

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DRAWING TITLE:
BUILDING ELEVATIONS - EAST AND NORTH

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/32"=1'-0"

Project No.: 18044.L01
Drawing No.: A-402.00

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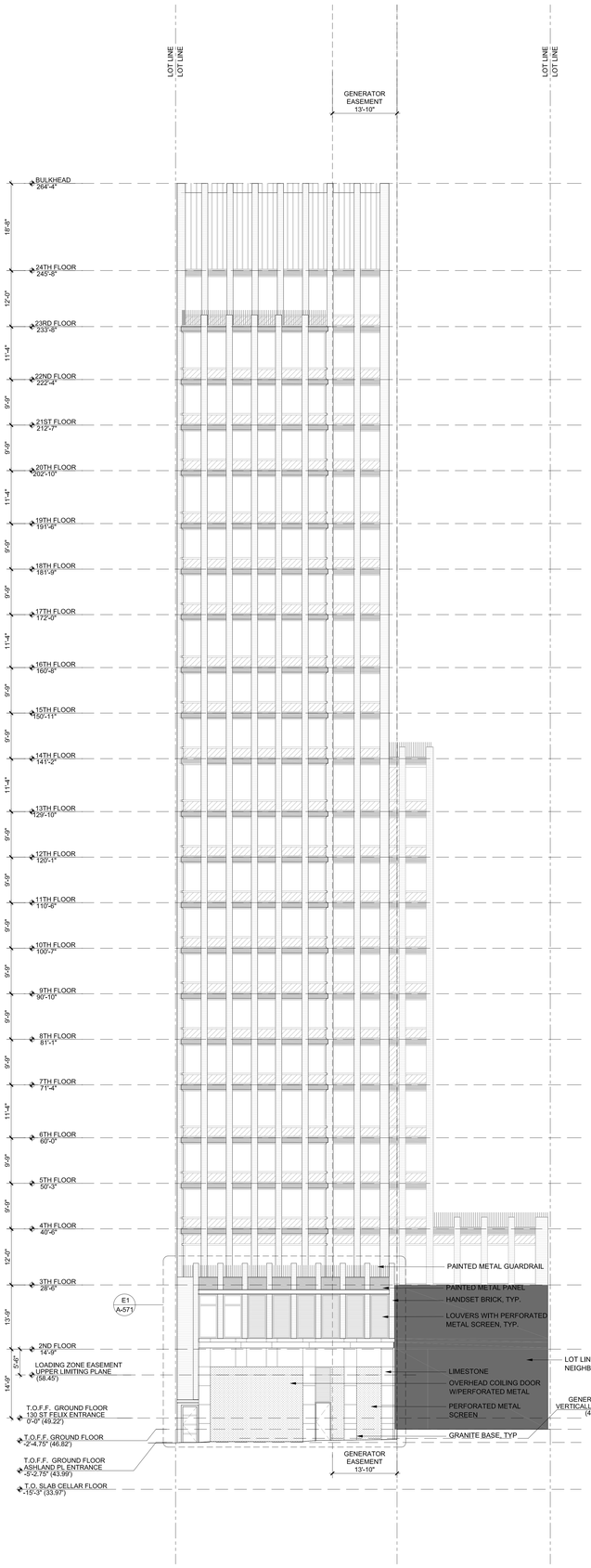
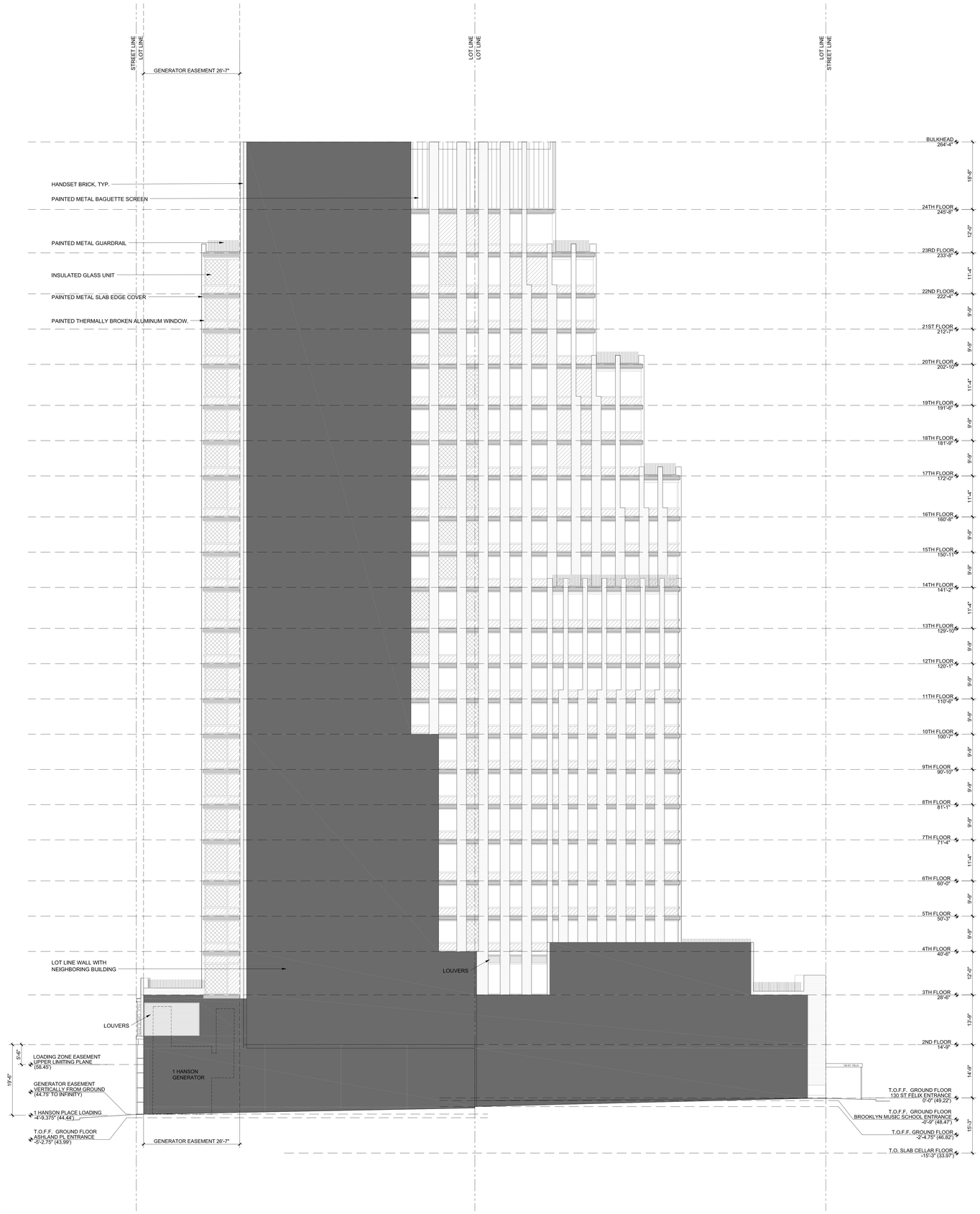


A1 WEST ELEVATION

3/32" = 1'-0"



A8 SOUTH ELEVATION

3/32" = 1'-0"

MATERIAL KEYING LEGEND:

HATCH LEGEND:

- FIRE RATED WINDOW
- SPANDREL WINDOW
- BRICK
- PAINTED METAL SLAB EDGE COVER
- FINISHED CMU OR CONCRETE WALL

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DRAWING TITLE:
BUILDING ELEVATIONS - WEST AND SOUTH

Seal:

Drawn: DRN
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Reviewed: RVD
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Scale: 3/32"=1'-0"
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LANGAN
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BROOKLYN MUSIC SCHOOL
130 Saint Felix Street, Brooklyn, NY 11217

DRAWING TITLE:
OVERALL BUILDING SECTIONS

Seal:

Drawn: DRN
Checked: CHK
Reviewed: RVD
Date: DATE
Scale: 3/32"=1'-0"

Project No.: 18044.L01
Drawing No.: A-404.00

A1 OVERALL BUILDING SECTION - EAST-WEST
3/32" = 1'-0"

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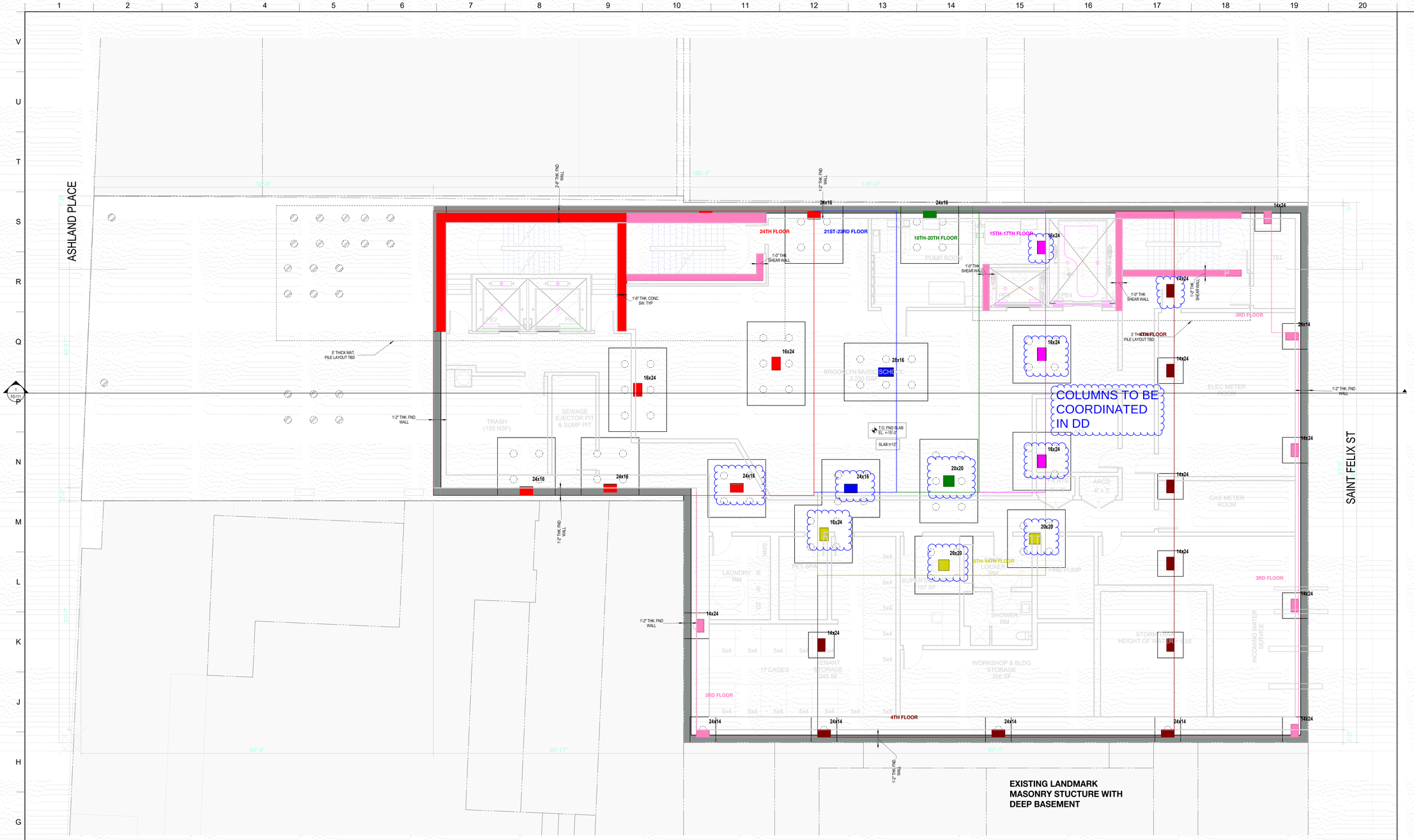
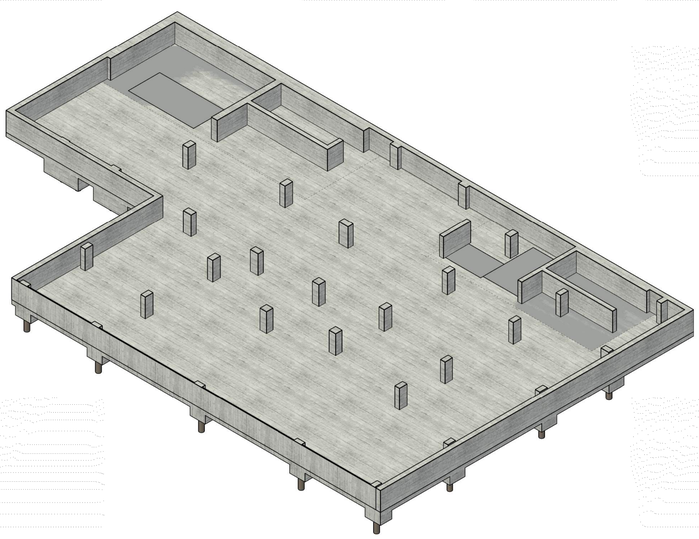


FOUNDATION/CELLAR FRAMING PLAN

SCALE: 3/16" = 1'-0"



LEGEND

DENOTES 13.375" DIAMETER DRILLED CASSON. SERVICE CAPACITY OF 250 TONS COMPRESSION AND 50 TONS TENSION.

TOP OF SLAB ELEVATION U.O.N.: PROJ. -15'-3" NAVD-88 33.97'	
SLAB THICKNESS U.O.N.: t = 12"	
SLAB CONCRETE STRENGTH: 8600 PSI	
SLAB TOP BARS U.O.N.: #5@12" O.C. E.W.	
SLAB BASIC BOTTOM BARS U.O.N.: #5@12" O.C. E.W.	

DRAWING NOTES:

1. FOR GENERAL NOTES SEE DRAWING S-001.
2. TOP OF SLAB EL. _____ UNLESS OTHERWISE NOTED THUS TOSL EL+ _____.
3. FOR FOUNDATION SCHEDULES SEE DRAWING S-102.
4. FOR TYPICAL FOUNDATION DETAILS SEE DRAWING S-103.
5. MINIMUM BOTTOM OF [FOOTING, PIER, PILE CAP].NOTED THUS [XX'-YY"].
6. FOUNDATION BOTTOM MAY NEED TO BE LOWERED DUE TO UNCOVERED [ROCK/SOIL] CONDITIONS. SEE GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
7. FOR COLUMN SCHEDULE SEE DRAWING S-201.
8. FOR SHEAR WALL SCHEDULE SEE DRAWING S-202.
9. OUTERMOST REINFORCING IN MAT RUNS EAST-WEST.

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	REVISIONS | SUBMISSIONS	DATE
1	100% SCHEMATIC DESIGN	3/2/2022

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130 SAINT FELIX | BROOKLYN, NY

DRAWING TITLE:
FOUNDATION/CELLAR FRAMING PLAN

Seal:

Drawn: Author
Checked: Checker
Reviewed:
Date: 01/31/22
Scale: As indicated

Project No.: 200185.00
Drawing No.: FO-101

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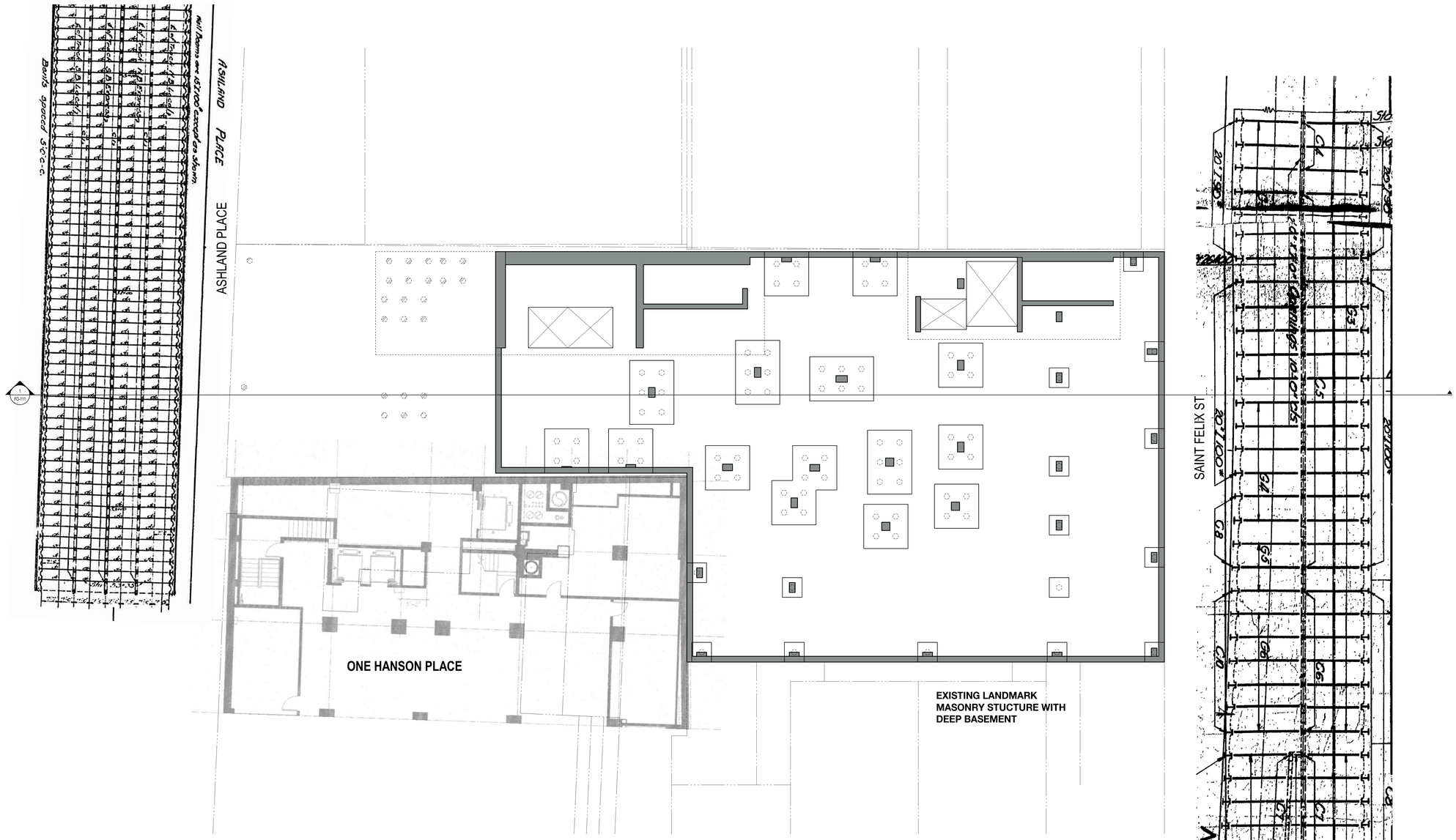

FOUNDATION/CELLAR OVERALL PLAN

SCALE: 1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	REVISIONS | SUBMISSIONS	DATE
1	100% SCHEMATIC DESIGN	3/2/2022

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DRAWING TITLE:
OVERALL PLAN VIEW

Seal:

Drawn: Author
Checked: Checker
Reviewed:
Date: 03/02/22
Scale: 1/8" = 1'-0"
Project No.: 200185.00
Drawing No.: FO-110

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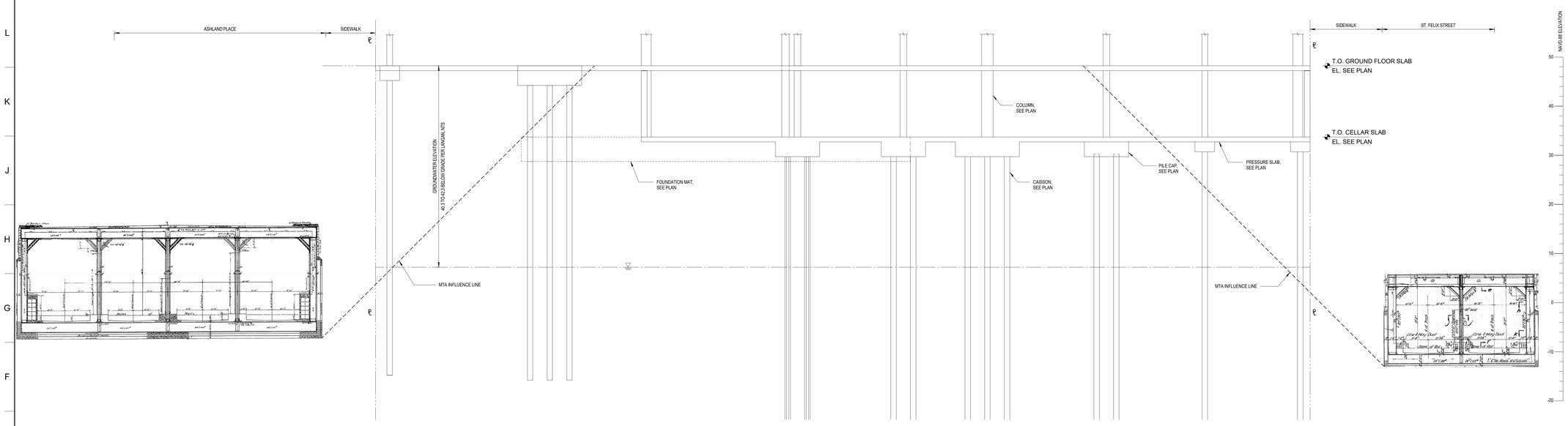

1 SECTION THROUGH BUILDING FOUNDATION LOOKING NORTH

SCALE: 1/8" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

NO.	REVISIONS | SUBMISSIONS	DATE
1	100% SCHEMATIC DESIGN	3/2/2022

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DRAWING TITLE:
TA SECTION

Seal:

Drawn: Author
Checked: Checker
Reviewed:
Date: 03/02/22
Scale: 1/8" = 1'-0"
Project No.: 200185.00
Drawing No.: FO-111

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APPENDIX C

NYSDEC Import and Reuse Form

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is: Choose an item

Have Ecological Resources been identified? Choose an item

Is this soil originating from the site? Choose an item

How many cubic yards of soil will be imported/reused? Choose an item

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone? Choose an item

Does it contain less than 10%, by weight, material that passes a size 100 sieve? Choose an item

Is this virgin material from a permitted mine or quarry? Choose an item

Is this material recycled concrete or brick from a DEC registered processing facility? Choose an item

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

_____ _____

Signature Date

_____

Print Name

_____

Firm

APPENDIX D

GSR and Climate Screening Checklist

Remedial Alternatives	GHG Emissions	Total energy Used	Water Consumption	Electricity Usage	Onsite NO_x Emissions	Onsite SO_x Emissions	Onsite PM_{10} Emissions	Total NO_x Emissions	Total SO_x Emissions	Total PM_{10} Emissions	Accident Risk Fatality	Accident Risk Injury
	metric ton	MMBTU	gallons	MWH	metric ton	metric ton	metric ton	metric ton	metric ton	metric ton		
Alt I - Track 1	186.97	2.31E+03	2.20E+04	0.00E+00	2.57E-01	3.83E-02	2.56E-02	6.02E-01	4.98E-01	2.87E-01	3.27E-04	2.79E-02
Alt II - Track 2/4	171.58	2.04E+03	1.76E+04	0.00E+00	7.86E-01	1.03E-01	7.73E-02	9.88E-01	3.41E-01	1.82E-01	2.21E-04	1.90E-02

Additional Sustainability Metrics

Remedial Alternatives	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury	Percent Electricity from Renewable Sources	Final Cost with Footprint Reduction
	tons	tons	cubic yards	$		%	$
Alt I - Track 1	870.00	0.00E+00	0.00E+00	0.00E+00	2.23E-01	0.0%	0.00E+00
Alt II - Track 2/4	255.00	0.00E+00	0.00E+00	0.00E+00	1.52E-01	0.0%	0.00E+00

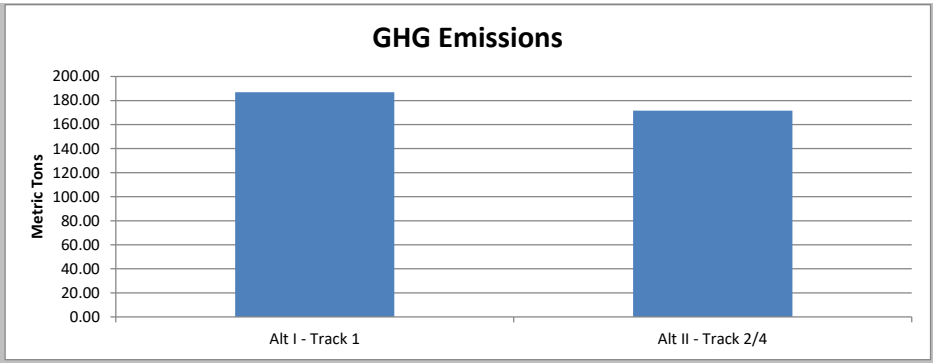
Relative Impact

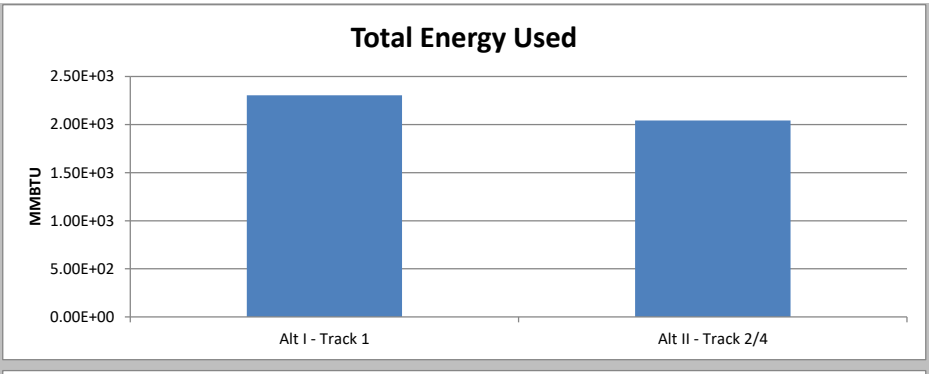
Remedial Alternatives	GHG Emissions	Energy Usage	Water Usage	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx emissions	Total SOx Emissions	Total PM10 Emissions	*Accident Risk Fatality	*Accident Risk Injury	Community Impacts	Resources Lost
Alt I - Track 1	High	High	High	Low	Medium	Medium	Medium	Medium	High	High	Low	Low	user select	user select
Alt II - Track 2/4	High	High	High	Low	High	High	High	High	Medium	Medium	Low	Low	user select	user select

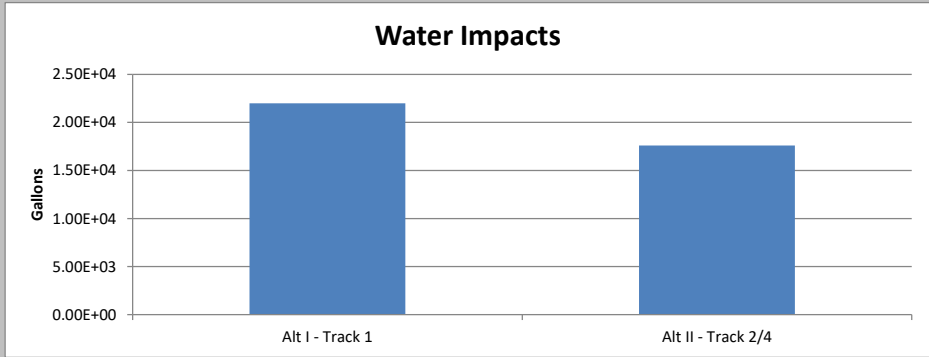
Relative Impact (User Override)

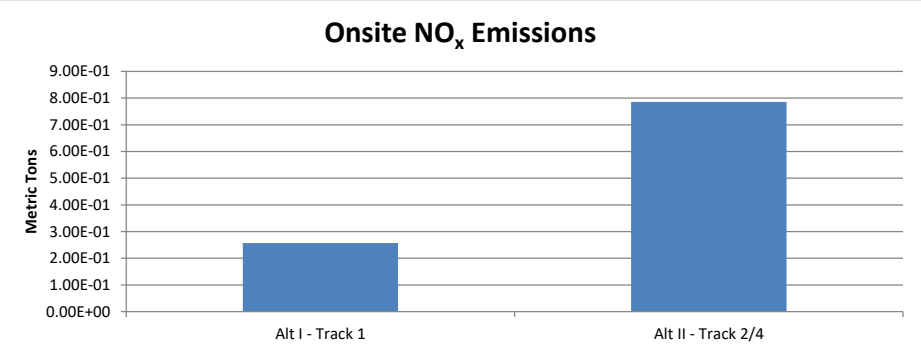
Remedial Alternatives	GHG Emissions	Energy Usage	Water Usage	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx Emissions	Total SOx Emissions	Total PM10 Emissions	*Accident Risk Fatality	*Accident Risk Injury	Community Impacts	Resources Lost
Alt I - Track 1	High	High	High	Low	Medium	Medium	Medium	Medium	High	High	Low	Low	user select	user select
Alt II - Track 2/4	High	High	High	Low	High	High	High	High	Medium	Medium	Low	Low	user select	user select

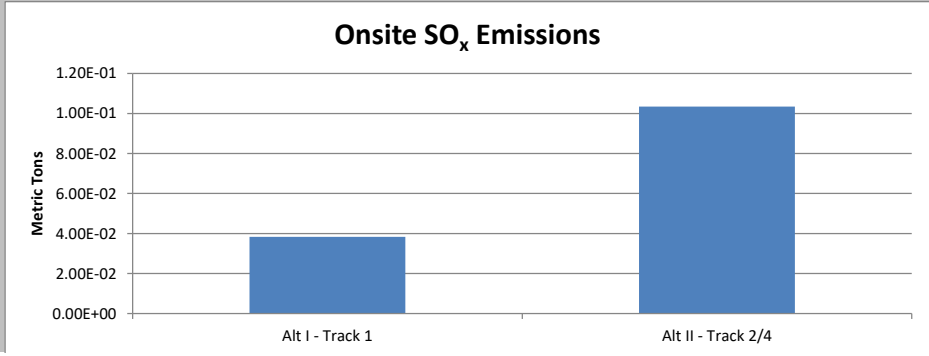
*Accident Risk is an estimate of how many accidents may occur. This risk is not the same as Cancer Risk, which is the probablity (for a single person) of getting cancer. Accident risk is not comparable to Cancer Risk due to inherent fundamental differences.

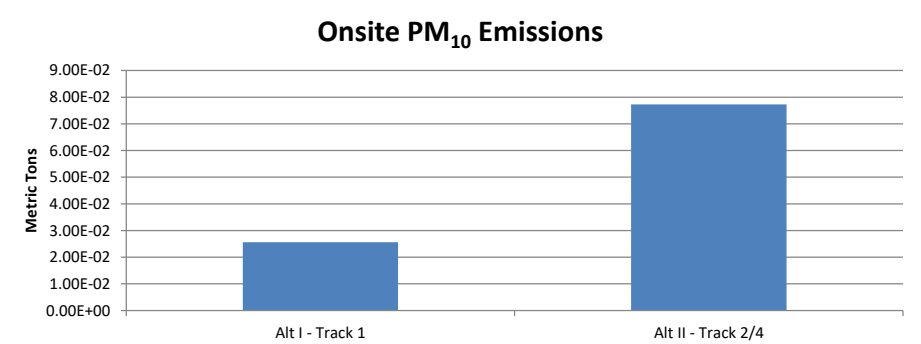

GHG Emissions
Metric Tons
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Alt I - Track 1
Alt II - Track 2/4

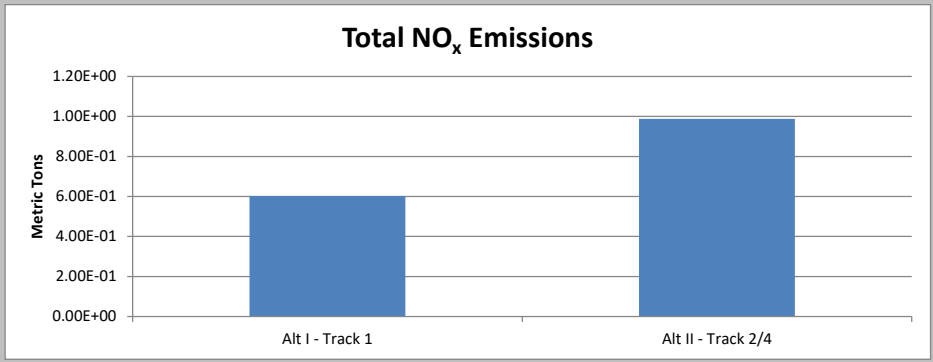

Total Energy Used
MMBTU
2.50E+03
2.00E+03
1.50E+03
1.00E+03
5.00E+02
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

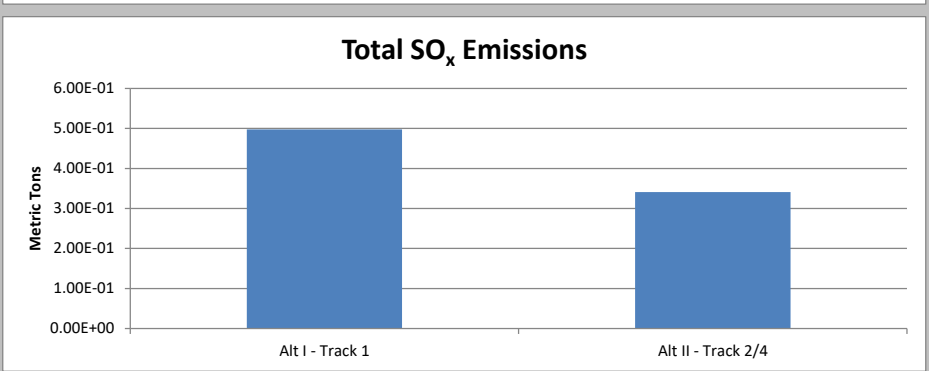

Water Impacts
Gallons
2.50E+04
2.00E+04
1.50E+04
1.00E+04
5.00E+03
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

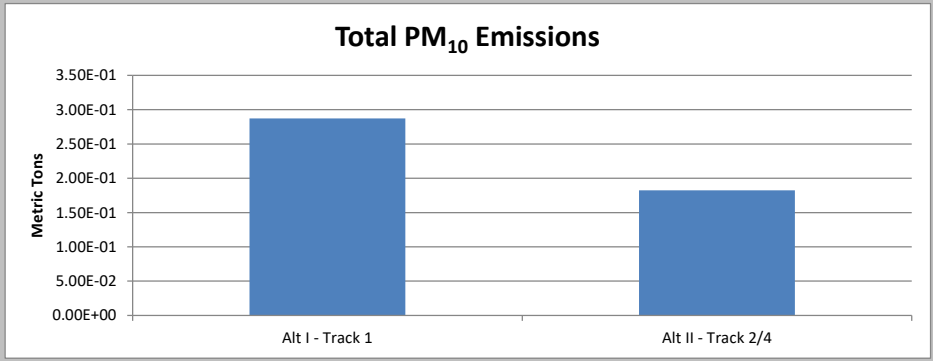

Onsite NOx Emissions
Metric Tons
9.00E-01
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

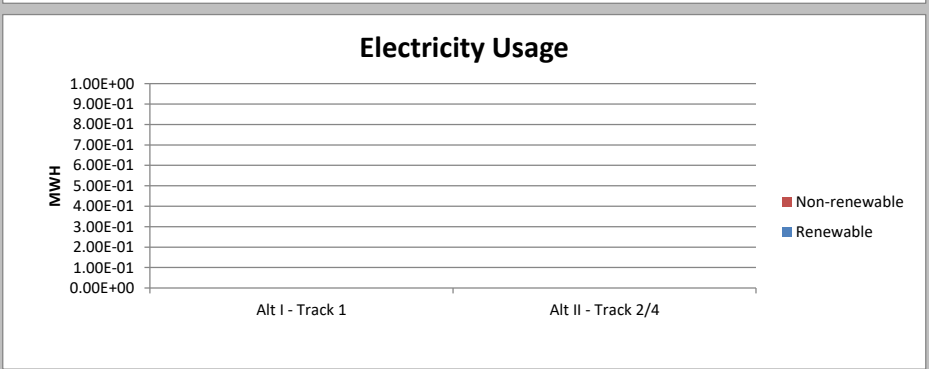

Onsite SOx Emissions
Metric Tons
1.20E-01
1.00E-01
8.00E-02
6.00E-02
4.00E-02
2.00E-02
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

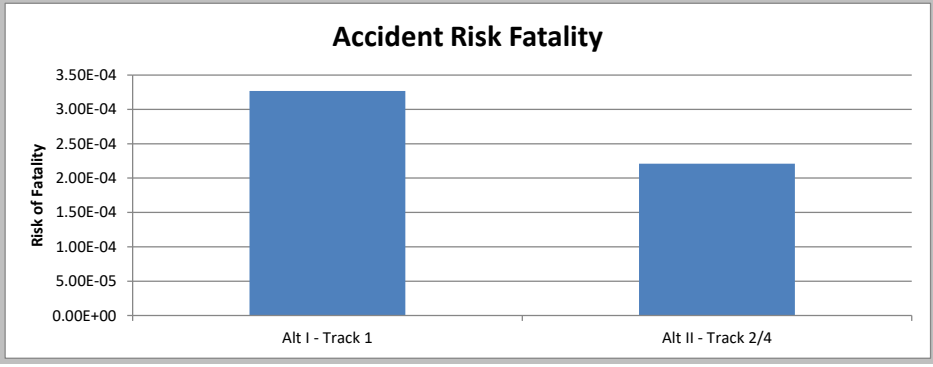

Onsite PM10 Emissions
Metric Tons
9.00E-02
8.00E-02
7.00E-02
6.00E-02
5.00E-02
4.00E-02
3.00E-02
2.00E-02
1.00E-02
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

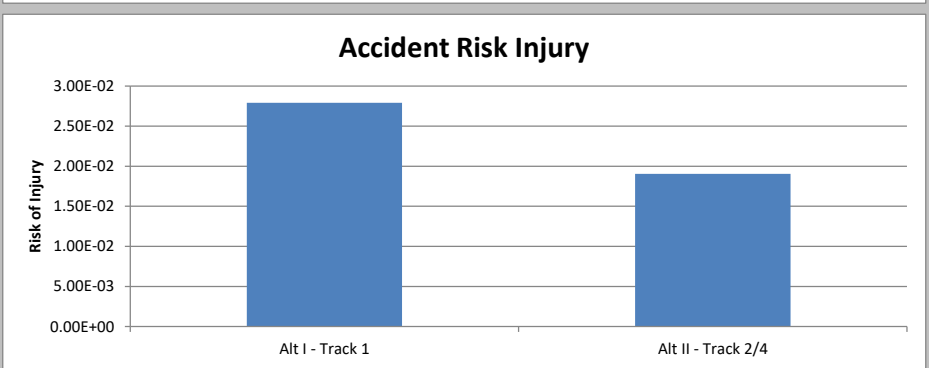

Total NO_x Emissions
Metric Tons
1.20E+00
1.00E+00
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

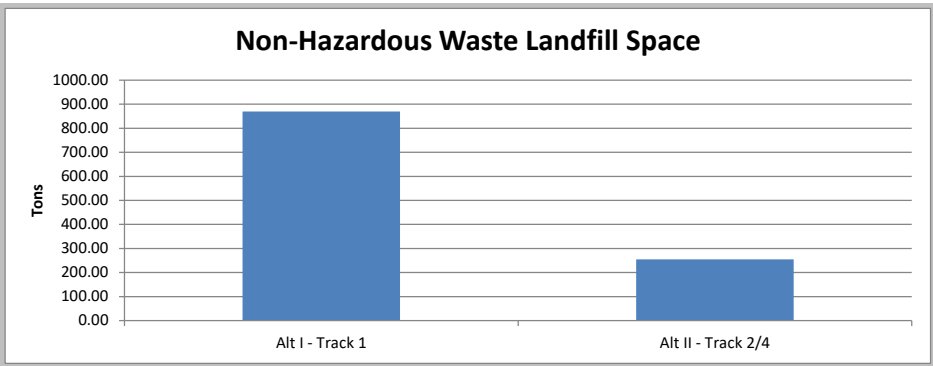

Total SO_x Emissions
Metric Tons
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

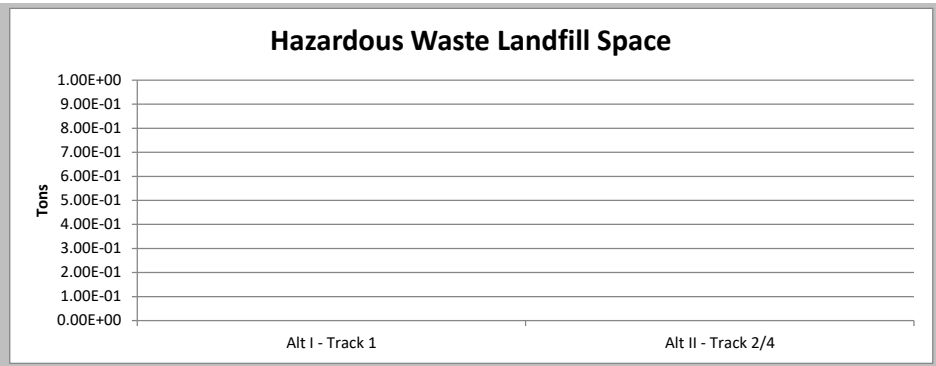

Total PM_{10} Emissions
Metric Tons
3.50E-01
3.00E-01
2.50E-01
2.00E-01
1.50E-01
1.00E-01
5.00E-02
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

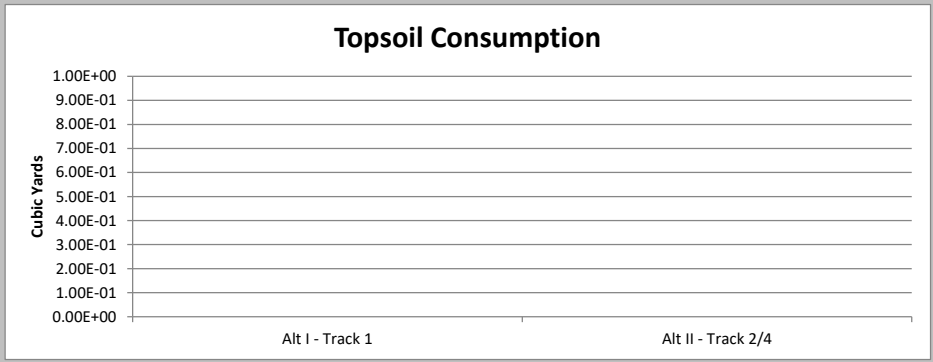

Electricity Usage
MWH
1.00E+00
9.00E-01
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Alt I - Track 1
Alt II - Track 2/4
Non-renewable
Renewable

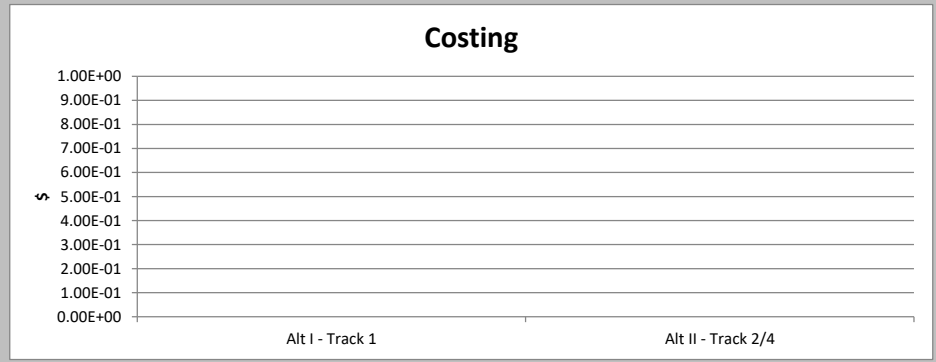

Accident Risk Fatality
Risk of Fatality
3.50E-04
3.00E-04
2.50E-04
2.00E-04
1.50E-04
1.00E-04
5.00E-05
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

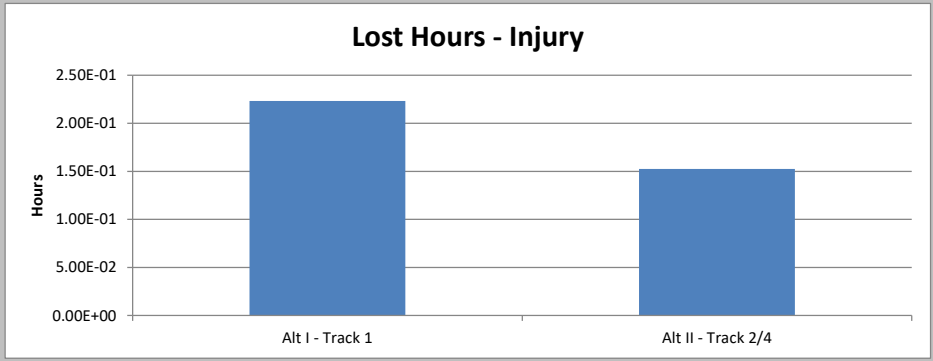

Accident Risk Injury
Risk of Injury
3.00E-02
2.50E-02
2.00E-02
1.50E-02
1.00E-02
5.00E-03
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

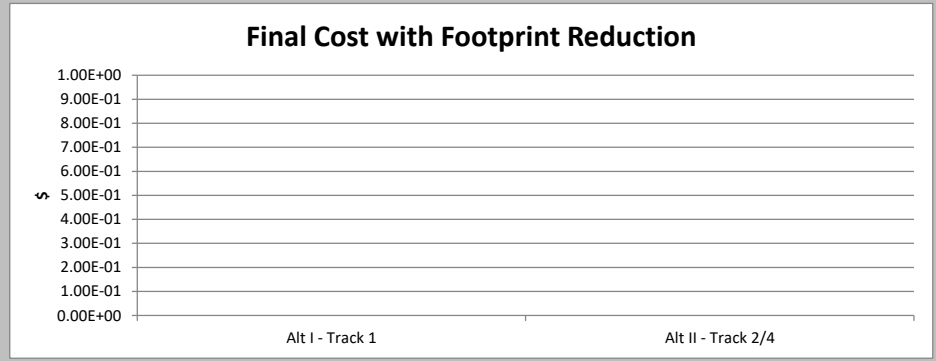

Non-Hazardous Waste Landfill Space
Tons
1000.00
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Alt I - Track 1
Alt II - Track 2/4

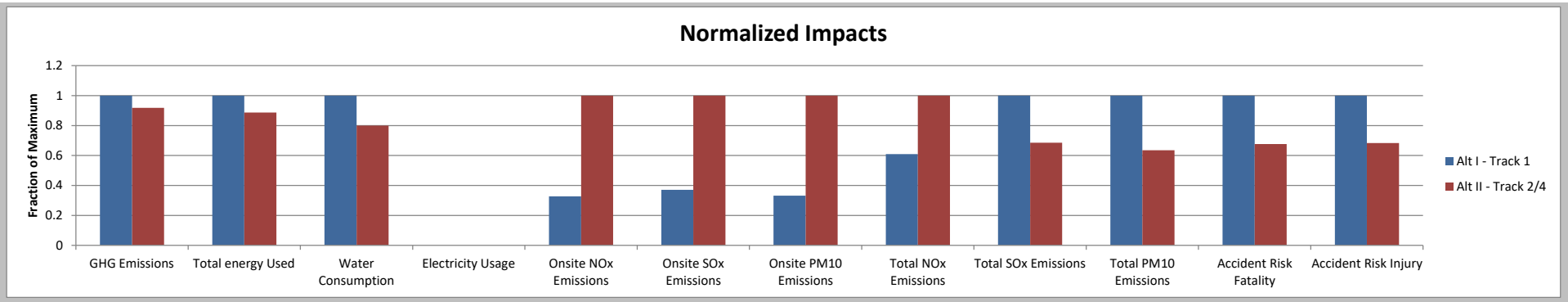

Hazardous Waste Landfill Space
Tons
1.00E+00
9.00E-01
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Alt I - Track 1
Alt II - Track 2/4


Topsoil Consumption
Cubic Yards
1.00E+00
9.00E-01
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Alt I - Track 1
Alt II - Track 2/4


Costing
$
1.00E+00
9.00E-01
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Alt I - Track 1
Alt II - Track 2/4


Lost Hours - Injury
Hours
2.50E-01
2.00E-01
1.50E-01
1.00E-01
5.00E-02
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

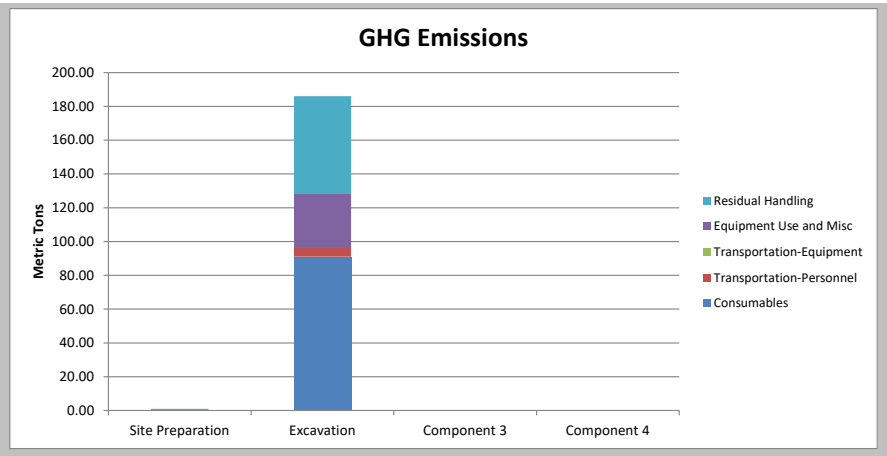

Final Cost with Footprint Reduction
$
1.00E+00
9.00E-01
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Alt I - Track 1
Alt II - Track 2/4

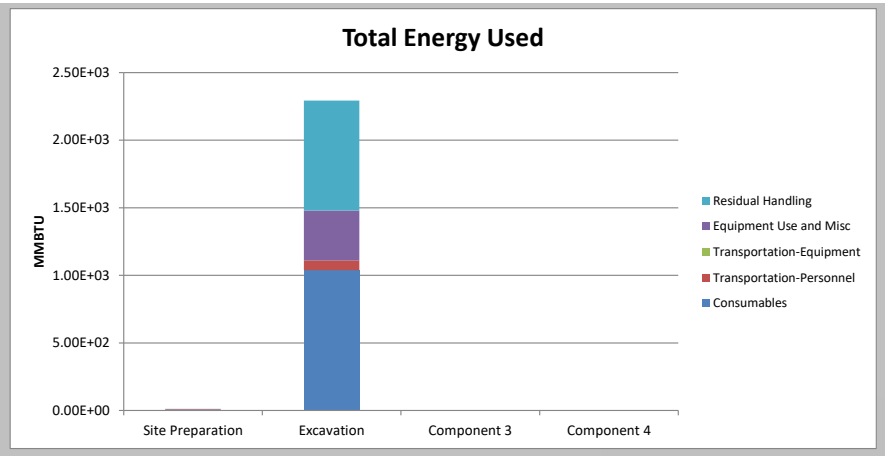

Normalized Impacts
Fraction of Maximum
1.2
1
0.8
0.6
0.4
0.2
0
GHG Emissions
Total energy Used
Water Consumption
Electricity Usage
Onsite NOx Emissions
Onsite SOx Emissions
Onsite PM10 Emissions
Total NOx Emissions
Total SOx Emissions
Total PM10 Emissions
Accident Risk Fatality
Accident Risk Injury
Alt I - Track 1
Alt II - Track 2/4

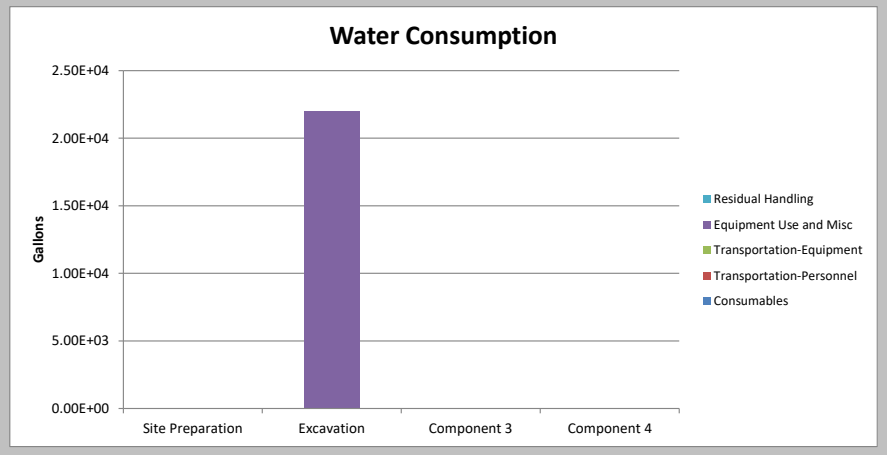
Sustainable Remediation - Environmental Footprint Summary
Alt I - Track 1

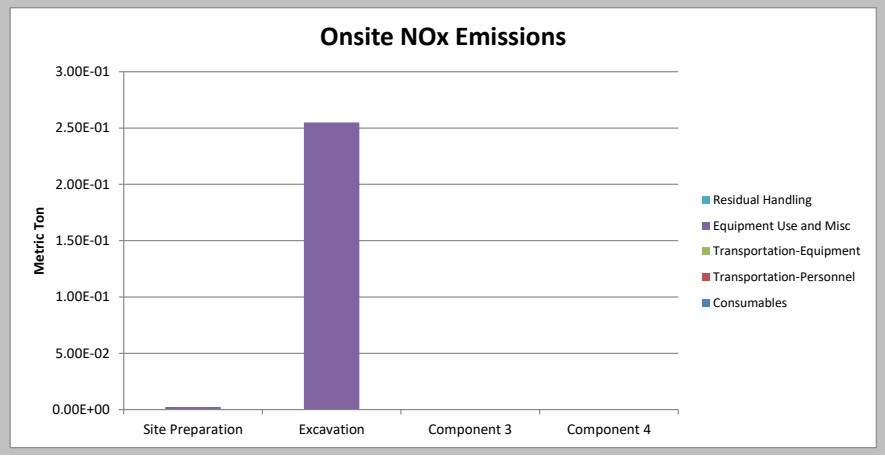
Phase	Activities	GHG Emissions	Total Energy Used	Water Consumption	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx Emissions	Total SOx Emissions	Total PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	MWH	metric ton	metric ton	metric ton	metric ton	metric ton	metric ton		
Site Preparation	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.62	8.0E+00	NA	NA	NA	NA	NA	2.1E-04	5.9E-06	2.7E-05	8.3E-06	6.7E-04
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.24	2.9E+00	0.0E+00	0.0E+00	2.3E-03	2.4E-04	2.1E-04	2.5E-03	3.1E-04	2.3E-04	2.5E-06	6.2E-04
	Residual Handling	0.07	9.7E-01	NA	NA	0.0E+00	0.0E+00	0.0E+00	2.3E-05	4.1E-07	6.2E-07	3.9E-07	3.1E-05
	Sub-Total	0.94	1.19E+01	0.00E+00	0.00E+00	2.32E-03	2.37E-04	2.09E-04	2.69E-03	3.13E-04	2.57E-04	1.12E-05	1.32E-03
Excavation	Consumables	90.99	1.0E+03	NA	NA	NA	NA	NA	2.5E-01	4.2E-01	1.0E-01	NA	NA
	Transportation-Personnel	5.73	7.2E+01	NA	NA	NA	NA	NA	2.1E-03	7.5E-05	4.3E-04	1.2E-04	9.4E-03
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	31.47	3.7E+02	2.2E+04	0.0E+00	2.5E-01	3.8E-02	2.5E-02	2.7E-01	4.7E-02	2.8E-02	6.9E-06	1.7E-03
	Residual Handling	57.84	8.1E+02	NA	NA	0.0E+00	0.0E+00	0.0E+00	7.0E-02	3.0E-02	1.6E-01	1.9E-04	1.5E-02
	Sub-Total	186.03	2.29E+03	2.20E+04	0.00E+00	2.55E-01	3.81E-02	2.54E-02	5.99E-01	4.98E-01	2.87E-01	3.16E-04	2.66E-02
Component 3	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Component 4	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total		**1.9E+02**	**2.3E+03**	**2.2E+04**	**0.0E+00**	**2.6E-01**	**3.8E-02**	**2.6E-02**	**6.0E-01**	**5.0E-01**	**2.9E-01**	**3.3E-04**	**2.8E-02**

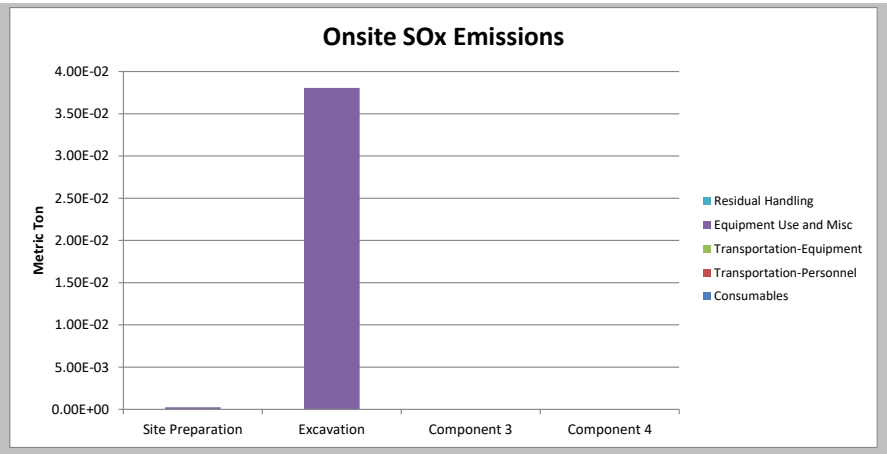
Remedial Alternative Phase	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury	Percent electricity from renewable sources	Total Cost with Footprint Reduction
	tons	tons	cubic yards	$		%	
Site Preparation	0.0E+00	0.0E+00	0.0E+00	0	1.1E-02	0.0%	$0
Excavation	8.7E+02	0.0E+00	0.0E+00	0	2.1E-01	0.0%	
Component 3	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00	0.0%	
Component 4	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00	0.0%	
Total	**8.7E+02**	**0.0E+00**	**0.0E+00**	**$0**	**2.2E-01**	**0.0%**	

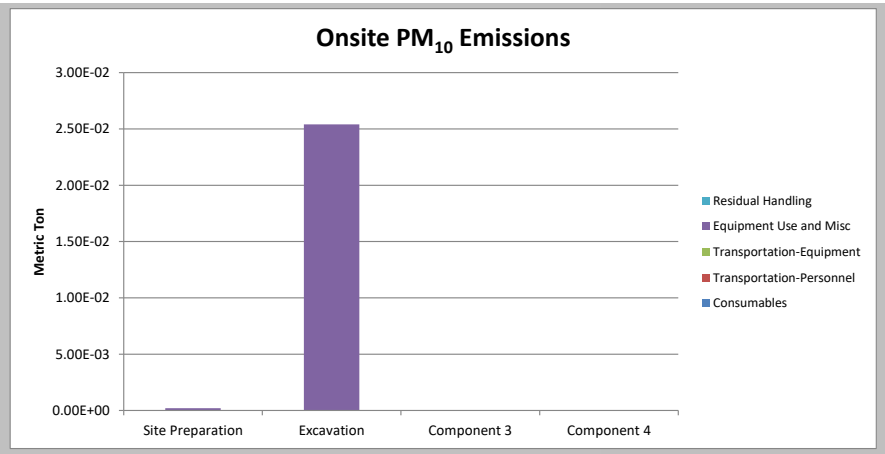

GHG Emissions
Metric Tons
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

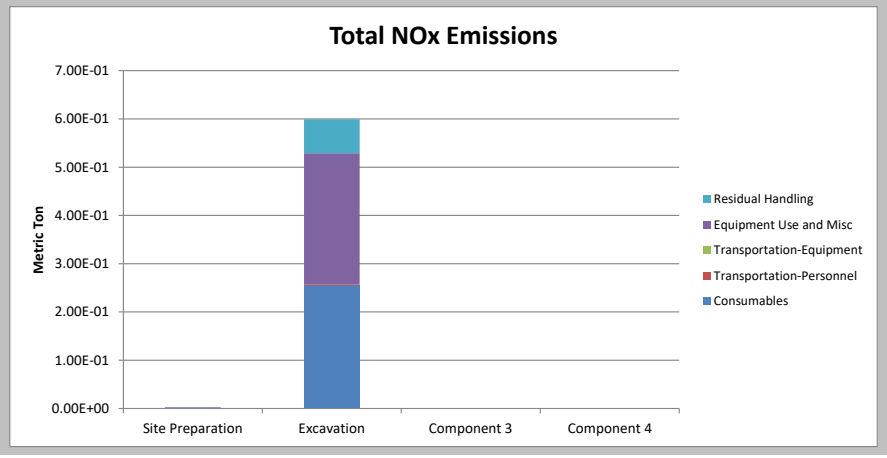

Total Energy Used
MMBTU
2.50E+03
2.00E+03
1.50E+03
1.00E+03
5.00E+02
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

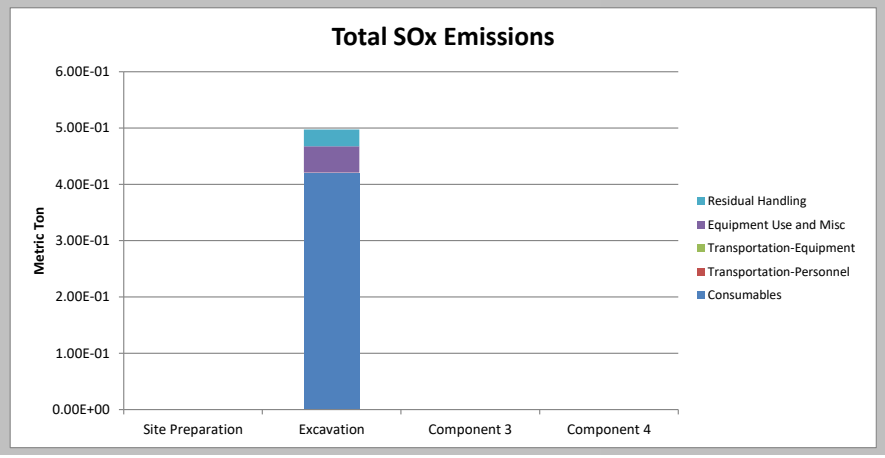

Water Consumption
Gallons
2.50E+04
2.00E+04
1.50E+04
1.00E+04
5.00E+03
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

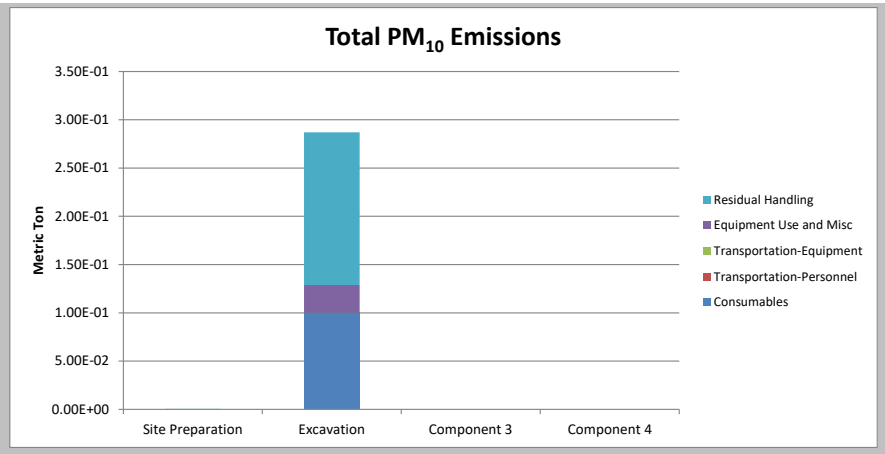

Onsite NOx Emissions
Metric Ton
3.00E-01
2.50E-01
2.00E-01
1.50E-01
1.00E-01
5.00E-02
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

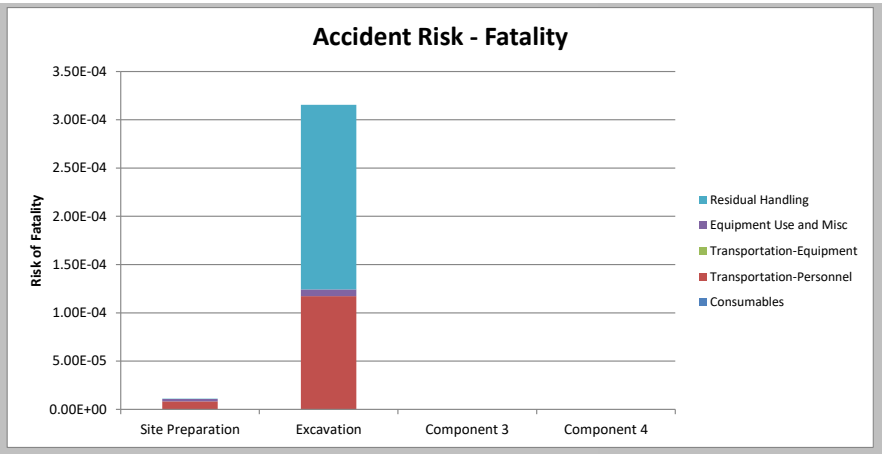

Onsite SOx Emissions
Metric Ton
4.00E-02
3.50E-02
3.00E-02
2.50E-02
2.00E-02
1.50E-02
1.00E-02
5.00E-03
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

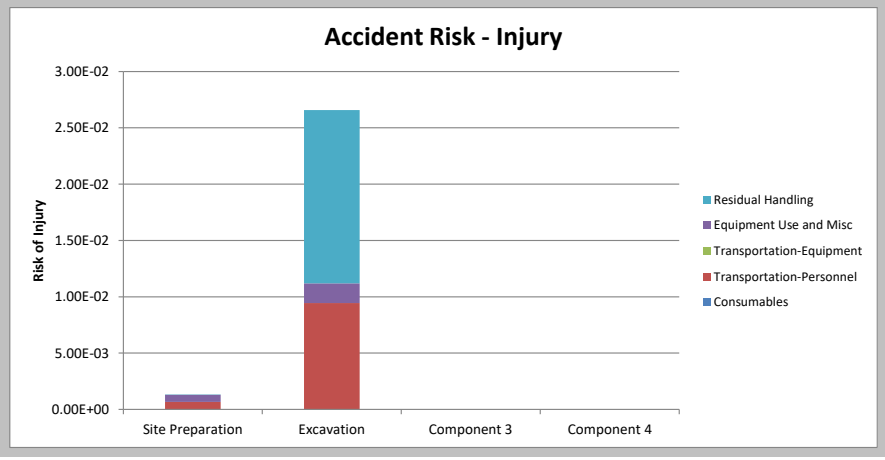

Onsite PM10 Emissions
Metric Ton
3.00E-02
2.50E-02
2.00E-02
1.50E-02
1.00E-02
5.00E-03
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

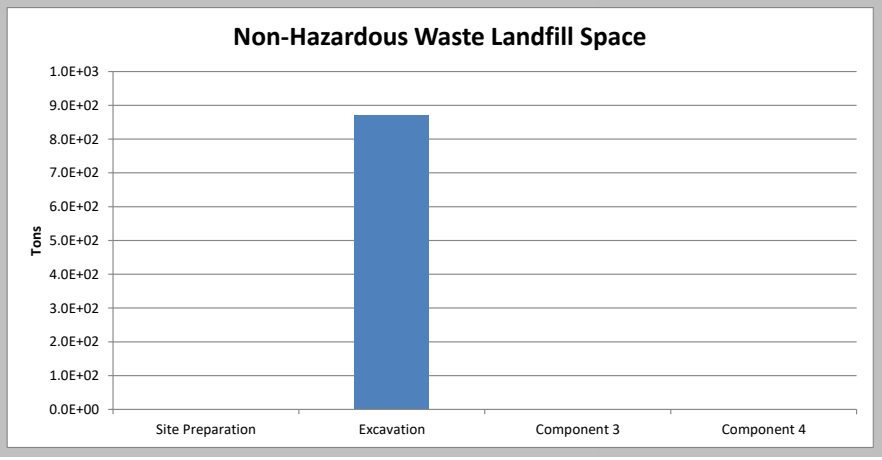

Total NOx Emissions
Metric Ton
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

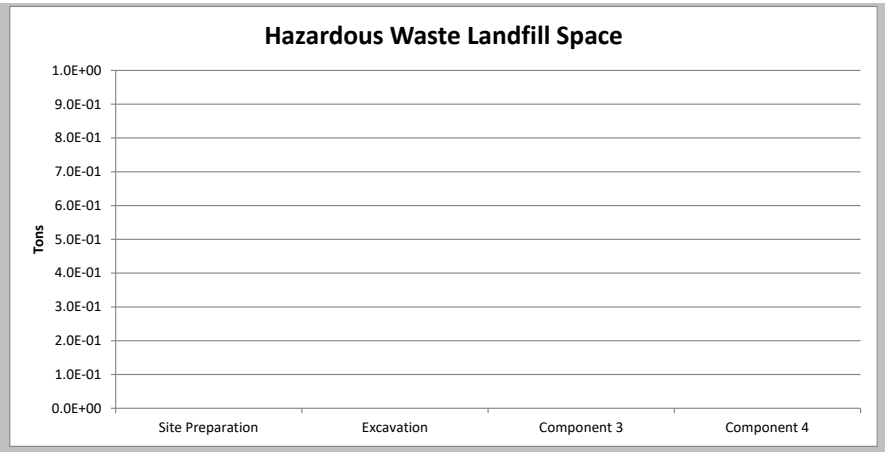

Total SOx Emissions
Metric Ton
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

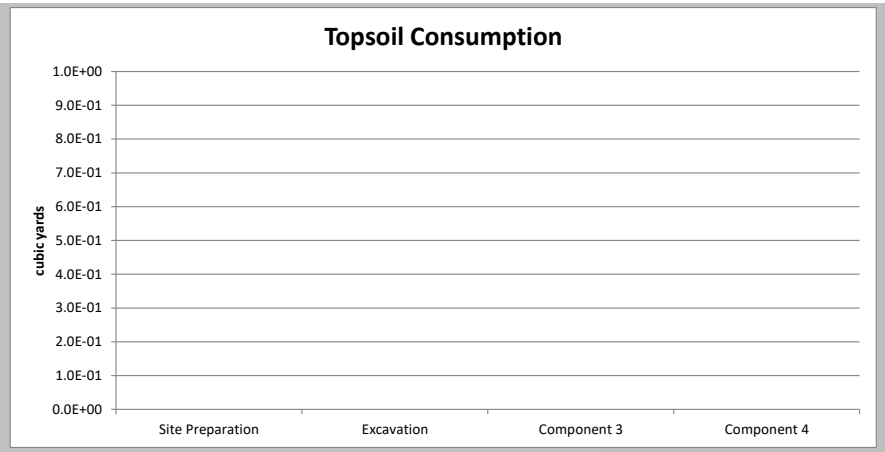

Total PM10 Emissions
Metric Ton
3.50E-01
3.00E-01
2.50E-01
2.00E-01
1.50E-01
1.00E-01
5.00E-02
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

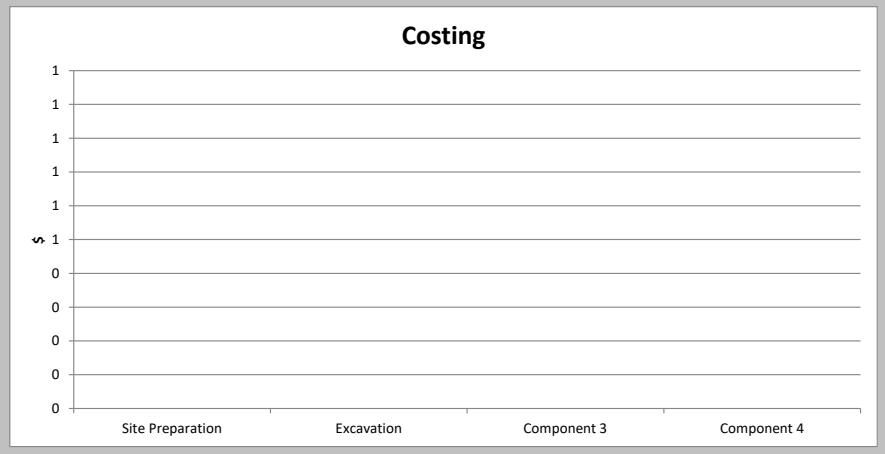

Accident Risk - Fatality
Risk of Fatality
3.50E-04
3.00E-04
2.50E-04
2.00E-04
1.50E-04
1.00E-04
5.00E-05
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

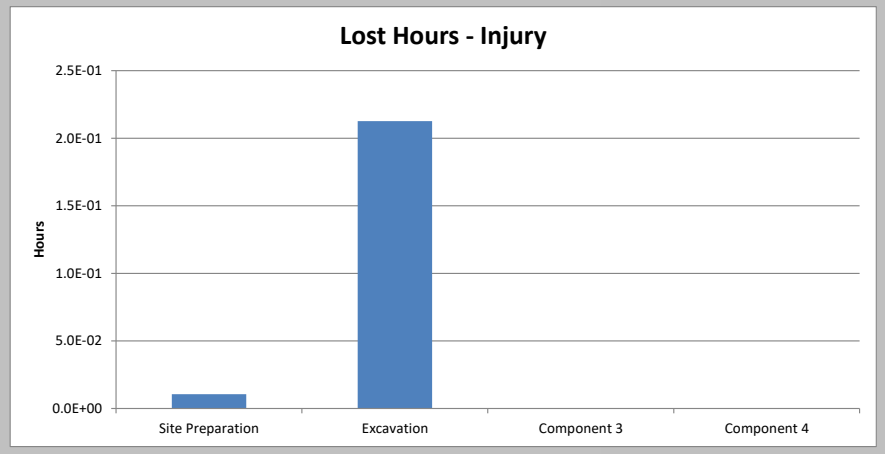

Accident Risk - Injury
Risk of Injury
3.00E-02
2.50E-02
2.00E-02
1.50E-02
1.00E-02
5.00E-03
0.00E+00
Site Preparation
Excavation
Component 3
Component 4
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Non-Hazardous Waste Landfill Space
Tons
1.0E+03
9.0E+02
8.0E+02
7.0E+02
6.0E+02
5.0E+02
4.0E+02
3.0E+02
2.0E+02
1.0E+02
0.0E+00
Site Preparation
Excavation
Component 3
Component 4


Hazardous Waste Landfill Space
Tons
1.0E+00
9.0E-01
8.0E-01
7.0E-01
6.0E-01
5.0E-01
4.0E-01
3.0E-01
2.0E-01
1.0E-01
0.0E+00
Site Preparation
Excavation
Component 3
Component 4


Topsoil Consumption
cubic yards
1.0E+00
9.0E-01
8.0E-01
7.0E-01
6.0E-01
5.0E-01
4.0E-01
3.0E-01
2.0E-01
1.0E-01
0.0E+00
Site Preparation
Excavation
Component 3
Component 4


Costing
$
1
1
1
1
1
1
0
0
0
0
0
Site Preparation
Excavation
Component 3
Component 4


Lost Hours - Injury
Hours
2.5E-01
2.0E-01
1.5E-01
1.0E-01
5.0E-02
0.0E+00
Site Preparation
Excavation
Component 3
Component 4

This worksheet allows the user to calculate the life cycle environmental footprint of the materials used

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WELL MATERIALS

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Specific casing material schedule	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Well diameter from drop down menu (in)	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Total weight of Sand (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Gravel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Bentonite (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Typical Cement (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of General Concrete (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Steel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Casing material type	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Weight of casing material (lb/ft)	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02
Total length of casing material required (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00
NOx emission factor (g/kg)	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
SOx emission factor (g/kg)	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00
PM_{10} emission factor (g/kg)	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00
MJ/kg material	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT CHEMICALS & MATERIALS

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Number of injection points	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Amount of material injected at each point (lbs dry mass)	0	0	0	0	0	0	0	0	0	0	0	0
Number of injections per injection point	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of injected material (lbs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total weight of injected material (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00
NOx emission factor (g/kg)	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00
SOx emission factor (g/kg)	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00
PM_{10} emission factor (g/kg)	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00
MJ/kg material	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT CHEMICALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT MEDIA

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Weight of media used (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC
Total weight of media (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00
NOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
SOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
PM10 emission factor (g/kg)	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04
MJ/kg material	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT MEDIA PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CONSTRUCTION MATERIALS

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner
Area of material (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of material (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00
NOx emission factor (g/kg)	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00
SOx emission factor (g/kg)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
PM10 emission factor (g/kg)	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00
MJ/kg material	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM CONSTRUCTION MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**

Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

WELL DECOMMISSIONING

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Well diameter (in)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of well (ft^3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Total volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02
NOx emission factor (g/kg)	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02
SOx emission factor (g/kg)	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01
PM10 emission factor (g/kg)	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02
MJ/kg material	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DECOMMISSIONING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

SILT CURTAIN MATERIALS

	CURTAIN 1	CURTAIN 2	CURTAIN 3	CURTAIN 4	CURTAIN 5	CURTAIN 6	CURTAIN 7	CURTAIN 8	CURTAIN 9	CURTAIN 10	CURTAIN 11	CURTAIN 12
Input length or perimeter of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Input depth of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Area of material required (ft^2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/ft^2 material)	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01
NOx emission factor (g/ft^3)	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01
SOx emission factor (g/ft^3)	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01
PM10 emission factor (g/ft^3)	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02
MJ/ft^2 material	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
CO_2 e emission factor (kg CO_2/linear ft material)	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00
NOx emission factor (g/linear ft)	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00
SOx emission factor (g/linear ft)	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00
PM10 emission factor (g/linear ft)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
MJ/linear ft material	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SILT CURTAIN MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

BULK MATERIAL QUANTITIES

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid
Units of quantity	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
Quantity	0	0	0	0	0	0	0	0	0	0	0	0
Density of material (kg/m^3)	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
NOx emission factor (g/kg)	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00
SOx emission factor (g/kg)	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00
PM10 emission factor (g/kg)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
MJ/kg material	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BULK MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM MATERIAL PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**

This worksheet allows the user to calculate the environmental footprint of personnel travel	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

TRANSPORTATION - ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle type	Cars	Heavy Duty	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
Fuel used	Gasoline	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Distance traveled per trip (miles)	60	70	100	130	0	0	0	0	0	0	0	0
Number of trips taken	4	3	1	4	0	0	0	0	0	0	0	0
Number of travelers	1	1	1	1	0	0	0	0	0	0	0	0
Total distance traveled (miles)	240	210	100	520	0	0	0	0	0	0	0	0
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	Yes	No	No	No	No	No	No	No	No	No	No
Consumption rate (MPG)	29	7.4	29	29	29	29	29	29	29	29	29	29
Estimated MPG (input the default if not known)	0	0	0	0	0	0	0	0	0	0	0	0
Total fuel used (gallons)	8.3	28.4	3.4	17.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/mile)	3.67E+02	1.37E+03	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02
N_2O emission factor (g/mile)	1.65E-02	1.54E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02
CH_4 emission factor (g/mile)	4.46E-01	1.54E+00	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01
NOx emission factor (g/mile)	1.41E-01	4.42E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01
SOx emission factor (g/mile)	4.97E-03	7.82E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03
PM_{10} emission factor (g/mile)	2.86E-02	3.93E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02
ENERGY OUTPUT												
Energy used (BTU)	1.2E+06	3.9E+06	4.8E+05	2.5E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	8.8E-02	2.9E-01	3.7E-02	1.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	1.2E-03	1.0E-03	5.1E-04	2.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	2.2E-03	6.8E-03	9.4E-04	4.9E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	3.4E-05	9.3E-05	1.4E-05	7.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	1.2E-06	1.6E-06	5.0E-07	2.6E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	6.9E-06	2.5E-06	2.9E-06	1.5E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	1.9E-06	1.6E-06	7.8E-07	4.1E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	1.5E-04	1.3E-04	6.3E-05	3.3E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**6.2E-01**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**2.1E-04**
Offsite SOx Emission (metric ton)	**5.9E-06**
Offsite PM_{10} Emission (metric ton)	**2.7E-05**
Accident Risk - Fatality	**8.3E-06**
Accident Risk - Injury	**6.7E-04**
Water Used (gallons)	**NA**
Energy Used (BTU)	**8.0E+06**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Number of flights taken	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843
CO_2 emission factor (kg/passenger mile)	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01
N_2O emission factor (g/passenger mile)	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03
CH_4 emission factor (g/passenger mile)	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02
NOx emission factor (g/passenger mile)	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01
SO_2 emission factor (g/passenger mile)	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02
PM_{10} emission factor (g/passenger mile)	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Type of rail used	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of trips taken	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
CO_2 emission factor (kg/passenger mile)	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01
N_2O emission factor (g/passenger mile)	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
CH_4 emission factor (g/passenger mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/passenger mile)	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02
SOx emission factor (g/passenger mile)	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01
PM_{10} emission factor (g/passenger mile)	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**

Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (BTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM PERSONNEL TRANSPORTATION	
CO_2 e Emission (metric ton)	6.2E-01
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	2.1E-04
Offsite SOx Emission (metric ton)	5.9E-06

This worksheet allows the user to calculate the environmental footprint of equipment and material transport	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EQUIPMENT TRANSPORTATION - DEDICATED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Account for an empty return trip?	No	No	No	No	No	No	No	No	No	No	No	No
Distance travelled (mi)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DEDICATED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

EQUIPMENT TRANSPORTATION - SHARED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency (ton-mpg)	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SHARED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
CO_2 emission factor (kg/ton mile)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
N_2O emission factor (g/ton mile)	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02
CH_4 emission factor (g/ton mile)	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02
NOx emission factor (g/ton mile)	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00
SOx emission factor (g/ton mile)	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01
PM_{10} emission factor (g/ton mile)	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**

Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02
CO_2 emission factor (kg/ton mile)	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02
N_2O emission factor (g/ton mile)	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04
CH_4 emission factor (g/ton mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/ton mile)	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01
SOx emission factor (g/ton mile)	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01
PM_{10} emission factor (g/ton mile)	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - WATER

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02
CO_2 emission factor (kg/ton mile)	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02
N_2O emission factor (g/ton mile)	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03
CH_4 emission factor (g/ton mile)	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04
NOx emission factor (g/ton mile)	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00
SOx emission factor (g/ton mile)	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01
PM_{10} emission factor (g/ton mile)	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM EQUIPMENT TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EARTHWORK EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate net power (hp)	65	65	65	65	65	65	65	65	65	65	65	65
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BACKHOE, DOZER, AND SCRAPER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

WELL DRILLING EQUIPMENT

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12
Number of injection and extraction points/wells	18	0	0	0	0	0	0	0	0	0	0	0
Drilling method	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push
Drilling fuel consumption rate (gal/hr)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Time spent drilling each injection site (hr)	1.5	0	0	0	0	0	0	0	0	0	0	0
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Total time drilling well (hr)	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total fuel consumption during drilling (gal)	21.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (kg/gallon)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
N_2O emission factor (g/gal)	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01
CH_4 emission factor (g/gal)	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01
NOx emission factor (g/gal)	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02
SOx emission factor (g/gal)	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01
PM_{10} emission factor (g/gal)	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01
Offsite NOx emission factor (g/hr)	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00
Offsite SOx emission factor (g/hr)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
Offsite PM_{10} emission factor (g/hr)	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01
ENERGY OUTPUT												
Energy used (BTU)	2.9E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission from drilling (metric ton)	2.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

	N_2O emission (metric ton CO_2 e)	8.3E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	5.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	1.3E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	6.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	2.0E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	2.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	2.4E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	2.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	ACCIDENT RISK												
	Fatality risk	2.5E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Injury risk	6.2E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DRILLING	
CO_2 e Emission (metric ton)	**2.4E-01**
Onsite NOx Emission (metric ton)	**2.3E-03**
Onsite SOx Emission (metric ton)	**2.4E-04**
Onsite PM_{10} Emission (metric ton)	**2.1E-04**
Offsite NOx Emission (metric ton)	**1.3E-04**
Offsite SOx Emission (metric ton)	**6.9E-05**
Offsite PM_{10} Emission (metric ton)	**2.0E-05**
Accident Risk - Fatality	**2.5E-06**
Accident Risk - Injury	**6.2E-04**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**2.9E+00**
Energy Used (MWh)	**NA**

TRENCHING EQUIPMENT

	Trencher 1	**Trencher 2**	**Trencher 3**	**Trencher 4**	**Trencher 5**	**Trencher 6**	**Trencher 7**	**Trencher 8**	**Trencher 9**	**Trencher 10**	**Trencher 11**	**Trencher 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Equipment operating hours	0	0	0	0	0	0	0	0	0	0	0	0

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

SEDIMENT MANAGEMENT (STAGING AND DRYING)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Is volume input that of saturated sediment?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Will the sediment be dry when this work is performed?	No	No	No	No	No	No	No	No	No	No	No	No
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Actual volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Approximate net power (hp)	175	175	175	175	175	175	175	175	175	175	175	175
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05
N_2O emission factor (g/hr)	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00
CH_4 emission factor (g/hr)	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00
Onsite NOx emission factor (g/hr)	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02
Onsite SOx emission factor (g/hr)	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02
Onsite PM_{10} emission factor (g/hr)	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01
Offsite NOx emission factor (g/hr)	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01
Offsite SOx emission factor (g/hr)	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01
Offsite PM_{10} emission factor (g/hr)	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SEDIMENT MANAGEMENT (STAGING AND DRYING)	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

This worksheet allows the user to calculate the environmental footprint of operating pumps on site

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

ELECTRIC PUMP OPERATION - For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pumps or unused methods

		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Method 1 - IF ELECTRICAL USAGE IS KNOWN													
	Pump electrical usage (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
Method 2 - IF PUMP HEAD IS KNOWN													
	Flow rate (gpm)	0	0	0	0	0	0	0	0	0	0	0	0
	Total head (ft)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Pump efficiency	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump times motor efficiency	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Specific gravity	1	1	1	1	1	1	1	1	1	1	1	1
	Pump horsepower (hp)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Method 3 - IF NAME PLATE SPECIFICATIONS ARE KNOWN													
	Pump horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Pump load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
SELECT REGION													
	Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
	CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
	N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
	CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
	NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
	SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
	PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
	Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
	ENERGY OUTPUT												
	Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx and SOx OUTPUT												
	NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRIC PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

DIESEL AND GASOLINE PUMPS

	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
Equipment operating hours (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02
N_2O emission factor (g/hr)	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02
CH_4 emission factor (g/hr)	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02
Onsite NOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00
Offsite NOx emission factor (g/hr)	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01

	Offsite SOx emission factor (g/hr)	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01
	Offsite PM_{10} emission factor (g/hr)	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02
	ENERGY OUTPUT												
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL AND GASOLINE PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM PUMP OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of using electrical equipment	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

Equipment Operation - For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Type of equipment	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower
Method 1 - IF NAME PLATE SPECIFICATIONS ARE KNOWN												
Equipment horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
Number of equipments operating	0	0	0	0	0	0	0	0	0	0	0	0
Operating time for each equipment (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Equipment load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - IF ELECTRICAL USAGE IS KNOWN												
Equipment electrical usage, if known (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
SELECT REGION												
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx and SOx OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRICAL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

GENERATORS

	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6	Generator 7	Generator 8	Generator 9	Generator 10	Generator 11	Generator 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02
N_2O emission factor (g/hr)	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02
CH_4 emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NOx emission factor (g/hr)	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00
SOx emission factor (g/hr)	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01
PM_{10} emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Offsite NOx emission factor (g/hr)	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01
Offsite SOx emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
Offsite PM_{10} emission factor (g/hr)	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM GENERATOR OPERATION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM ELECTRICAL EQUIPMENT OPERATIONS	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00

This worksheet allows the user to calculate the environmental footprint of equipment use	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

AGRICULTURAL EQUIPMENT

	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6	Tillage Tractor 7	Tillage Tractor 8	Tillage Tractor 9	Tillage Tractor 10	Tillage Tractor 11	Tillage Tractor 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area to till (acre)	0	0	0	0	0	0	0	0	0	0	0	0
Soil condition	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil
Soil type	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of tillage (in)	0	0	0	0	0	0	0	0	0	0	0	0
Tractor horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tractor horsepower used	16	16	16	16	16	16	16	16	16	16	16	16
Consumption rate (gal/hr)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Actual equipment operating hours (hr), limited by tractor horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03
N_2O emission factor (g/hr)	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01
CH_4 emission factor (g/hr)	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00
NOx emission factor (g/hr)	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01
SOx emission factor (g/hr)	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00
PM_{10} emission factor (g/hr)	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00
Offsite NOx emission factor (g/hr)	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00
Offsite SOx emission factor (g/hr)	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00
Offsite PM_{10} emission factor (g/hr)	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TRACTOR AND TILLER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CAPPING EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Equipment type	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Calculated area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Actual equipment operating hours (hr), limited by machine horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower used	11	11	11	11	11	11	11	11	11	11	11	11
Consumption Rate (gal/hr)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03
N_2O emission factor (g/hr)	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01
CH_4 emission factor (g/hr)	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01
Onsite NOx emission factor (g/hr)	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01
Onsite SOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Offsite NOx emission factor (g/hr)	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00

Offsite SOx emission factor (g/hr)	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00
Offsite PM_{10} emission factor (g/hr)	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROLLER AND PAVER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

MIXING EQUIPMENT

	Mixer 1	**Mixer 2**	**Mixer 3**	**Mixer 4**	**Mixer 5**	**Mixer 6**	**Mixer 7**	**Mixer 8**	**Mixer 9**	**Mixer 10**	**Mixer 11**	**Mixer 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Volume (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
N_2O emission factor (g/hr)	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02
CH_4 emission factor (g/hr)	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01
Onsite NOx emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite NOx emission factor (g/hr)	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00
Offsite SOx emission factor (g/hr)	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01
Offsite PM_{10} emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM MIXER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**

Energy Used (MWh)	**NA**

INTERNAL COMBUSTION ENGINES

	Engine 1	Engine 2	Engine 3	Engine 4	Engine 5	Engine 6	Engine 7	Engine 8	Engine 9	Engine 10	Engine 11	Engine 12
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Estimated fuel consumption rate (gal or scf/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel used (gal or scf)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon or scf fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal or scf)	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04
N_2O emission factor (g/gal or scf)	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01
CH_4 emission factor (g/gal or scf)	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01
Onsite NOx emission factor (g/gal or scf)	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01
Onsite SOx emission factor (g/gal or scf)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/gal or scf)	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00
Offsite NOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM INTERNAL COMBUSTION ENGINE OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OTHER FUELED EQUIPMENT

	Fuel 1	Fuel 2	Fuel 3	Fuel 4	Fuel 5	Fuel 6	Fuel 7	Fuel 8	Fuel 9	Fuel 10	Fuel 11	Fuel 12
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Volume (scf for Natural gas, gallons for all others)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon or scf	983	983	983	983	983	983	983	983	983	983	983	983
CO2 emission factor (lb/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
N2O emission factor (lb/MMBTU)	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03
CH4 emission factor (lb/MMBTU)	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00
NOx emission factor (lb/MMBTU)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
SOx emission factor (lb/MMBTU)	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04
PM10 emission factor (lb/MMBTU)	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02
Offsite NOx emission factor (g/gal or scf)	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01
Offsite SOx emission factor (g/gal or scf)	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02
Offsite PM_{10} emission factor (g/gal or scf)	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OTHER FUELED EQUIPMENT	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

DIESEL EQUIPMENT (PER HOUR BASIS)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Choose equipment type from drop down menu	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Choose equipment size for Dozer (HP)	65	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1
Choose equipment size for Loader (HP)	65	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Choose equipment size for Excavator (HP)	150	150	150	150	150	150	150	150	150	150	150	150
Choose equipment size for Scraper (HP)	330	330	330	330	330	330	330	330	330	330	330	330
Choose equipment size for Crawler Crane	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1
Choose equipment size for Tillage Tractor (HP)	16	16	16	16	16	16	16	16	16	16	16	16
Choose equipment size for Paver (HP)	25	25	25	25	25	25	25	25	25	25	25	25
Choose equipment size for Roller (HP)	6	6	6	6	6	6	6	6	6	6	6	6
Choose equipment size for Trencher (HP range)	6 to 11	7 to 11	8 to 11	9 to 11	10 to 11	11 to 11	12 to 11	13 to 11	14 to 11	15 to 11	16 to 11	17 to 11
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate equipment size for earthwork equipment	65	65	65	65	65	65	65	65	65	65	65	65
Approximate equipment size for other equipment	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Corrected Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OPERATOR LABOR

	Occupation 1	Occupation 2	Occupation 3	Occupation 4	Occupation 5	Occupation 6	Occupation 7	Occupation 8	Occupation 9	Occupation 10	Occupation 11	Occupation 12
Occupation	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers
Total time worked onsite (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fatality risk per labor hour	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08
Injury risk per labor hour	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OPERATOR LABOR	
CO_2 e Emission (metric ton)	**NA**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	NA
Offsite SOx Emission (metric ton)	NA
Offsite PM_{10} Emission (metric ton)	NA
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (MMBTU)	NA
Energy Used (MWh)	NA

LABORATORY ANALYSIS

	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Analysis 5	Analysis 6	Analysis 7	Analysis 8	Analysis 9	Analysis 10	Analysis 11	Analysis 12
Dollars spent on laboratory analysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy used (MMBTU/$)	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03
CO2 e emission factor (lb/$)	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
NOx emission factor (lb/$)	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03

This worksheet allows the user to calculate the environmental footprint of residual handling

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

RESIDUE DISPOSAL/RECYCLING

	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	Yes	Yes	No	No	No	No	No	No	No	No	No	No
Weight of the waste transported to landfill or recycling (tons)	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used	Diesel	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Total number of trips	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of miles per trip	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total distance traveled (miles)	50	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.0	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	9.7E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	7.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	2.5E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	1.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	2.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	4.1E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	6.2E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	3.9E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	3.1E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**7.4E-02**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**2.3E-05**
Offsite SOx Emission (metric ton)	**4.1E-07**
Offsite PM_{10} Emission (metric ton)	**6.2E-07**
Accident Risk - Fatality	**3.9E-07**
Accident Risk - Injury	**3.1E-05**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**9.7E-01**
Energy Used (MWh)	**NA**

LANDFILL OPERATIONS

	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6	Operation 7	Operation 8	Operation 9	Operation 10	Operation 11	Operation 12
Landfill type	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
Waste disposed in landfill (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Landfill methane emissions (metric tons CH_4)	0	0	0	0	0	0	0	0	0	0	0	0
Waste disposed in non-hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waste disposed in hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy used (MMBTU/ton)	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01
Electricity used (MWh/ton)	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03
CO_2 e emission factor (lb/ton)	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01
NOx emission factor (lb/ton)	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01
SOx emission factor (lb/ton)	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02
PM_{10} emission factor (lb/ton)	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM LANDFILL OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

THERMAL/CATALYTIC OXIDIZERS

	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6	Oxidizer 7	Oxidizer 8	Oxidizer 9	Oxidizer 10	Oxidizer 11	Oxidizer 12
Oxidizer type	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Waste gas flow rate (scfm)	0	0	0	0	0	0	0	0	0	0	0	0
Time running (hours)	0	0	0	0	0	0	0	0	0	0	0	0
Input waste gas inlet temperature (F)	0	0	0	0	0	0	0	0	0	0	0	0
Input contaminant concentration (ppmV)	0	0	0	0	0	0	0	0	0	0	0	0
Heat capacity at inlet (BTU/scf - F)	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179
Combustion temperature (F)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Heat exchanger efficiency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heating value for fuel (BTU/scf)	983	983	983	983	983	983	983	983	983	983	983	983
Waste inlet temp after heat exchanger (F)	0	0	0	0	0	0	0	0	0	0	0	0
Waste gas heat content (BTU/scf)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Supplemental heat required (BTU/min)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total fuel consumed (scf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO_2 emission factor (lb/MMBTU)	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02
N_2O emission factor (lb/MMBTU)	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03
CH_4 emission factor (lb/MMBTU)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
Onsite NOx emission factor (lb/MMBTU)	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00
Onsite SOx emission factor (lb/MMBTU)	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04
Onsite PM_{10} emission factor (lb/MMBTU)	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
Offsite NOx emission factor (g/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
Offsite SOx emission factor (g/MMBTU)	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Offsite PM_{10} emission factor (g/MMBTU)	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM THERMAL OXIDIZERS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**7.4E-02**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**2.3E-05**
Offsite SOx Emission (metric ton)	**4.1E-07**

This worksheet allows the user to calculate the water used and GHG emissions from onsite activities

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WATER CONSUMPTION

	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6	Treatment System 7	Treatment System 8	Treatment System 9	Treatment System 10	Treatment System 11	Treatment System 12
Water consumed from municipal water treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Water disposed to wastewater treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Total water consumption (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption (Btu/gal) for water treatment	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00
CO_2 e emission factor (kg/gal) for water treatment	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03
NOx emission factor (g/gal) for water treatment	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03
SOx emission factor (g/gal) for water treatment	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03
PM_{10} emission factor (g/gal) for water treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
Energy consumption (Btu/gal) for wastewater treatment	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01
CO_2 e emission factor (kg/gal) for wastewater treatment	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/gal) for wastewater treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
SOx emission factor (g/gal) for wastewater treatment	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03
PM10 emission factor (g/gal) for wastewater treatment	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER CONSUMPTION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gal)	0.0E+00
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

ONSITE LAND AND WATER RESOURCE CONSUMPTION

	Entire Site 1	Entire Site 2	Entire Site 3	Entire Site 4	Entire Site 5	Entire Site 6	Entire Site 7	Entire Site 8	Entire Site 9	Entire Site 10	Entire Site 11	Entire Site 12
Volume of topsoil brought to site (cubic yards)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of groundwater or surface water lost (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOTAL FROM ONSITE LAND AND WATER RESOURCE CONSUMPTION	
Topsoil consumption (yd^3)	0.0E+00
Water loss (gal)	0.0E+00

TOTAL FROM RESOURCE CONSUMPTION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Consumption (gal)	0.0E+00
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

Environmental Footprint Summary

Activities	CO_2 Emissions	Percent Total	Onsite NOx emissions	Percent Total	Onsite SOx Emissions	Percent Total	Onsite PM_{10} Emissions	Percent Total	Total NOx emissions	Percent Total	Total SOx Emissions	Percent Total	Total PM_{10} Emissions	Percent Total	Total Energy Used	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	MMBTU	%		%		%
Material Productions	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	NA	NA	NA	NA
Transportation-Personnel	0.62	66.25	NA	-	NA	-	NA	-	2.1E-04	7.9	5.9E-06	1.9	2.7E-05	10.5	8.0E+00	67.1	8.3E-06	74.5	6.7E-04	50.7
Transportation-Equip/materials	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Equipment Use and Misc	0.24	25.84	2.3E-03	100.0	2.4E-04	100.0	2.1E-04	100.0	2.5E-03	91.2	3.1E-04	98.0	2.3E-04	89.2	2.9E+00	24.7	2.5E-06	22.0	6.2E-04	46.9
Residual Handling	0.07	7.91	0.0E+00	-	0.0E+00	-	0.0E+00	-	2.3E-05	0.9	4.1E-07	0.1	6.2E-07	0.2	9.7E-01	8.2	3.9E-07	3.5	3.1E-05	2.4
Total	0.94	100	2.32E-03	100.0	2.37E-04	100	2.09E-04	100	2.69E-03	100	3.13E-04	100	2.57E-04	100	1.19E+01	100	1.1E-05	100	1.3E-03	100

NA: Not Available or Not Applicable

Environmental Footprint Summary continued

Activities	Water Usage	Percent Total	Electrical Usage	Lost Hours - Injury	Percent Total
	gallons	%	MWH		%
Material Productions	NA	NA	NA	NA	NA
Transportation-Personnel	NA	NA	NA	5.4E-03	50.7
Transportation-Equipment	NA	NA	NA	0.0E+00	-
Equipment Use and Misc	0.00	-	0.00E+00	5.0E-03	46.9
Residual Handling	NA	NA	NA	2.5E-04	2.4
Total	0.00E+00	100	0.00E+00	1.06E-02	100.0

Footprint Reduction

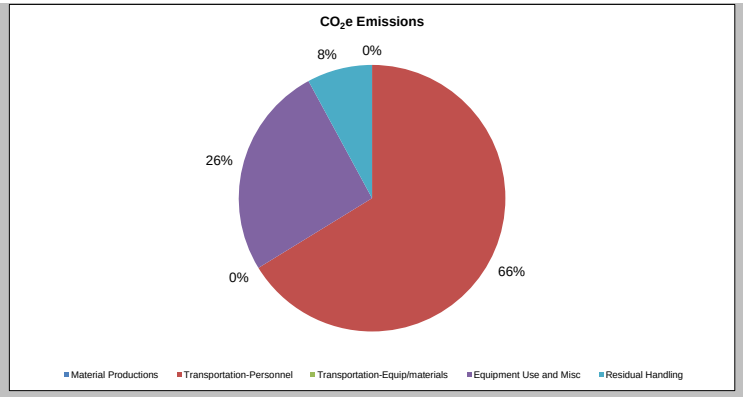
Total electricity replacement (MWh)	0.00E+00
Total electricity replacement (mmBtu)	0.00E+00
Percent electricity from renewable sources (%)	0.0%
Landfill gas reduction (metric ton CO_2 e)	0.00E+00
GHG emissions (metric ton CO2 e)	0.00E+00
NOx emissions (metric ton)	0.00E+00
SOx emissions (metric ton)	0.00E+00
PM10 emissions (metric ton)	0.00E+00
Water consumption reduction (gallons)	0.00E+00

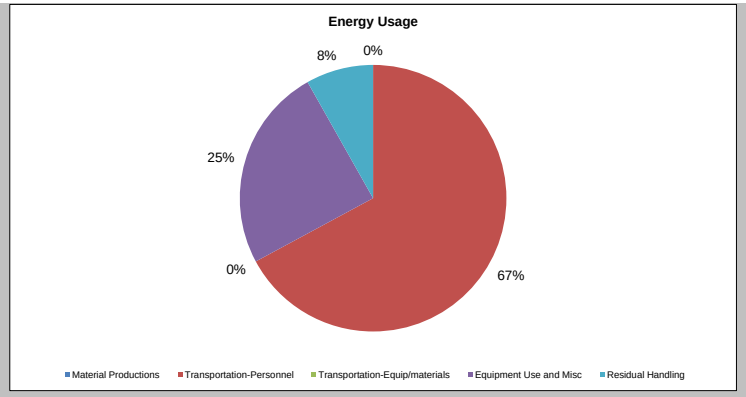
Additional Sustainability Metrics

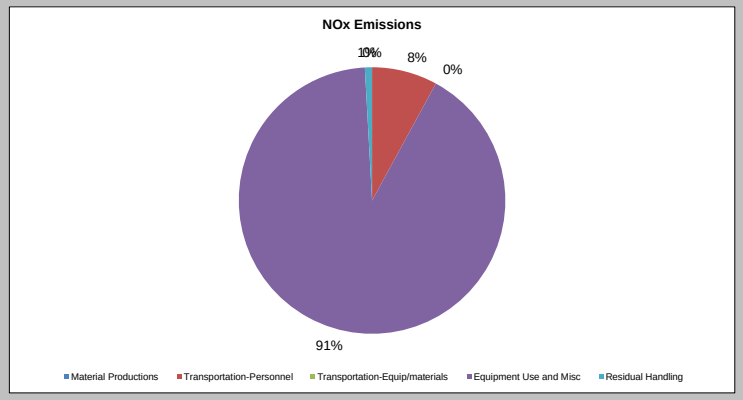
Non-Hazardous Waste Landfill Space (tons)	0.0
Hazardous Waste Landfill Space (tons)	0.0
Topsoil Consumption (yd^3)	0.0
Cost of Phase ($)	0.0
Lost Hours - Injury	0.0

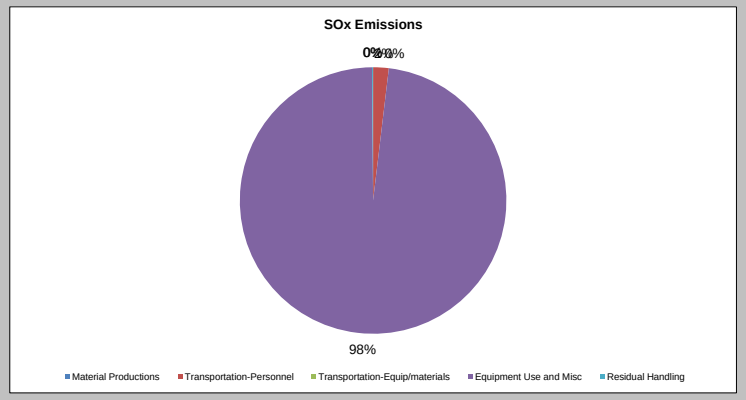
Duration of Phase

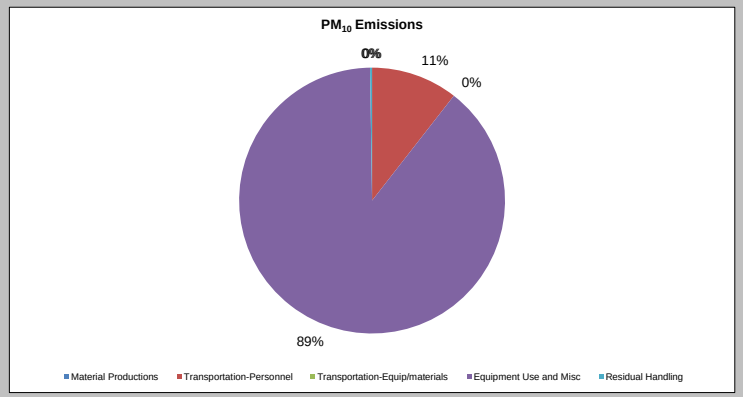
Duration (unit time)	1

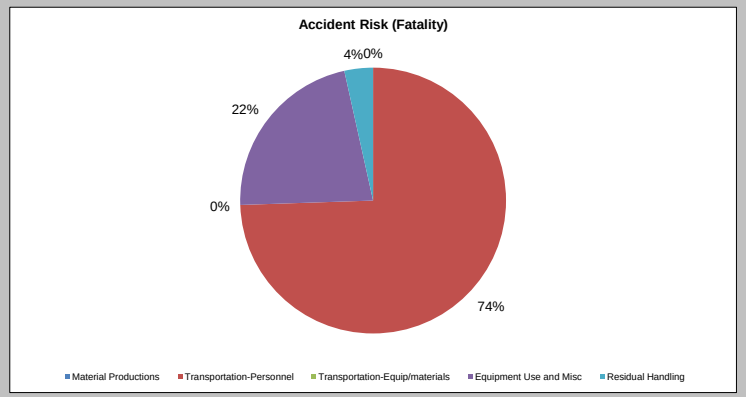

CO_2e Emissions
8%
0%
26%
66%
0%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

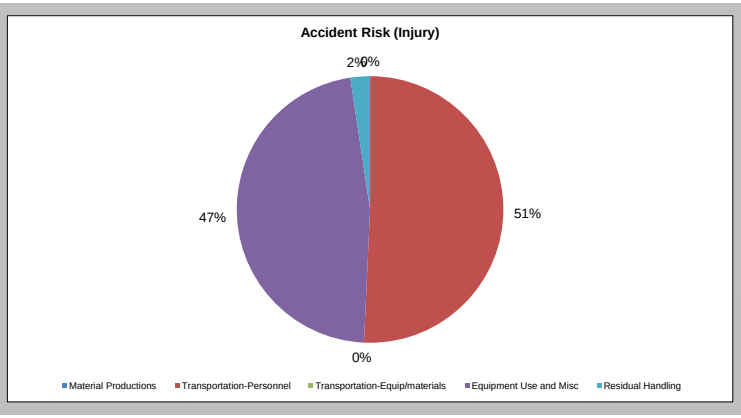

Energy Usage
8%
0%
25%
0%
67%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

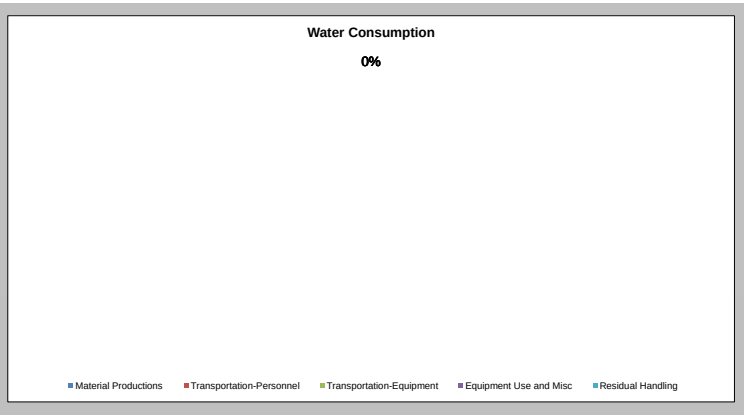

NOx Emissions
8%
0%
91%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


SOx Emissions
98%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


PM_{10} Emissions
11%
0%
89%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Fatality)
4%
0%
22%
0%
74%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Injury)
2%
0%
47%
51%
0%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Water Consumption
0%
Material Productions
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

This worksheet allows the user to calculate the life cycle environmental footprint of the materials used

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WELL MATERIALS

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Specific casing material schedule	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Well diameter from drop down menu (in)	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Total weight of Sand (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Gravel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Bentonite (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Typical Cement (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of General Concrete (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Steel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Casing material type	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Weight of casing material (lb/ft)	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02
Total length of casing material required (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00
NOx emission factor (g/kg)	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
SOx emission factor (g/kg)	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00
PM_{10} emission factor (g/kg)	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00
MJ/kg material	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT CHEMICALS & MATERIALS

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Number of injection points	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Amount of material injected at each point (lbs dry mass)	0	0	0	0	0	0	0	0	0	0	0	0
Number of injections per injection point	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of injected material (lbs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total weight of injected material (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00
NOx emission factor (g/kg)	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00
SOx emission factor (g/kg)	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00
PM_{10} emission factor (g/kg)	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00
MJ/kg material	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT CHEMICALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT MEDIA

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Weight of media used (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC
Total weight of media (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00
NOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
SOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
PM10 emission factor (g/kg)	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04
MJ/kg material	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT MEDIA PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CONSTRUCTION MATERIALS

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner
Area of material (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of material (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00
NOx emission factor (g/kg)	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00
SOx emission factor (g/kg)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
PM10 emission factor (g/kg)	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00
MJ/kg material	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM CONSTRUCTION MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**

Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

WELL DECOMMISSIONING

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Well diameter (in)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of well (ft^3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Total volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02
NOx emission factor (g/kg)	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02
SOx emission factor (g/kg)	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01
PM10 emission factor (g/kg)	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02
MJ/kg material	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DECOMMISSIONING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

SILT CURTAIN MATERIALS

	CURTAIN 1	CURTAIN 2	CURTAIN 3	CURTAIN 4	CURTAIN 5	CURTAIN 6	CURTAIN 7	CURTAIN 8	CURTAIN 9	CURTAIN 10	CURTAIN 11	CURTAIN 12
Input length or perimeter of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Input depth of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Area of material required (ft^2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/ft^2 material)	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01
NOx emission factor (g/m^3)	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01
SOx emission factor (g/ft^3)	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01
PM10 emission factor (g/ft^3)	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02
MJ/ft^2 material	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
CO_2 e emission factor (kg CO_2/linear ft material)	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00
NOx emission factor (g/linear ft)	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00
SOx emission factor (g/linear ft)	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00
PM10 emission factor (g/linear ft)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
MJ/linear ft material	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SILT CURTAIN MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

BULK MATERIAL QUANTITIES

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	Steel	Gravel	General Concrete	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid
Units of quantity	pounds	pounds	cubic feet	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
Quantity	50,580	2,100,000	3,917	0	0	0	0	0	0	0	0	0
Density of material (kg/m^3)	7860.0	1682.0	2371.0	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6
Total weight of material required (kg)	22942.7	952544.0	262984.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.77E+00	1.70E-02	1.30E-01	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
NOx emission factor (g/kg)	5.31E+00	6.80E-02	2.60E-01	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00
SOx emission factor (g/kg)	8.85E+00	8.50E-02	5.20E-01	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00
PM10 emission factor (g/kg)	1.77E+00	3.40E-02	1.04E-01	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
MJ/kg material	24.4	0.3	1.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
ENERGY OUTPUT												
Energy used (BTU)	5.3E+08	2.7E+08	2.4E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	4.1E+01	1.6E+01	3.4E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	1.2E-01	6.5E-02	6.8E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	2.0E-01	8.1E-02	1.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	4.1E-02	3.2E-02	2.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BULK MATERIALS	
CO_2 e Emission (metric ton)	**9.1E+01**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**2.5E-01**
Offsite SOx Emission (metric ton)	**4.2E-01**
Offsite PM_{10} Emission (metric ton)	**1.0E-01**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**1.0E+09**
Energy Used (MWh)	**NA**

TOTAL FROM MATERIAL PRODUCTION	
CO_2 e Emission (metric ton)	**9.1E+01**
Onsite NOx Emission (metric ton)	**NA**

This worksheet allows the user to calculate the environmental footprint of personnel travel	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

TRANSPORTATION - ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle type	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Distance traveled per trip (miles)	60	0	130	0	0	0	0	0	0	0	0	0
Number of trips taken	203	0	22	0	0	0	0	0	0	0	0	0
Number of travelers	1	0	1	0	0	0	0	0	0	0	0	0
Total distance traveled (miles)	12180	0	2860	0	0	0	0	0	0	0	0	0
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Consumption rate (MPG)	29	29	29	29	29	29	29	29	29	29	29	29
Estimated MPG (input the default if not known)	0	0	0	0	0	0	0	0	0	0	0	0
Total fuel used (gallons)	420.0	0.0	98.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/mile)	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02
N_2O emission factor (g/mile)	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02
CH_4 emission factor (g/mile)	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01
NOx emission factor (g/mile)	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01
SOx emission factor (g/mile)	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03
PM_{10} emission factor (g/mile)	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02
ENERGY OUTPUT												
Energy used (BTU)	5.8E+07	0.0E+00	1.4E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	4.5E+00	0.0E+00	1.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	6.2E-02	0.0E+00	1.5E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	1.1E-01	0.0E+00	2.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	1.7E-03	0.0E+00	4.0E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	6.0E-05	0.0E+00	1.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	3.5E-04	0.0E+00	8.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	9.5E-05	0.0E+00	2.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	7.6E-03	0.0E+00	1.8E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**5.7E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**2.1E-03**
Offsite SOx Emission (metric ton)	**7.5E-05**
Offsite PM_{10} Emission (metric ton)	**4.3E-04**
Accident Risk - Fatality	**1.2E-04**
Accident Risk - Injury	**9.4E-03**
Water Used (gallons)	**NA**
Energy Used (BTU)	**7.2E+07**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Number of flights taken	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843
CO_2 emission factor (kg/passenger mile)	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01
N_2O emission factor (g/passenger mile)	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03
CH_4 emission factor (g/passenger mile)	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02
NOx emission factor (g/passenger mile)	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01
SO_2 emission factor (g/passenger mile)	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02
PM_{10} emission factor (g/passenger mile)	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Type of rail used	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of trips taken	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
CO_2 emission factor (kg/passenger mile)	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01
N_2O emission factor (g/passenger mile)	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
CH_4 emission factor (g/passenger mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/passenger mile)	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02
SOx emission factor (g/passenger mile)	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01
PM_{10} emission factor (g/passenger mile)	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**

Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (BTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM PERSONNEL TRANSPORTATION	
CO_2 e Emission (metric ton)	5.7E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	2.1E-03
Offsite SOx Emission (metric ton)	7.5E-05

This worksheet allows the user to calculate the environmental footprint of equipment and material transport	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EQUIPMENT TRANSPORTATION - DEDICATED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Fuel used	Diesel	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Account for an empty return trip?	No	No	No	No	No	No	No	No	No	No	No	No
Distance travelled (mi)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	135,847	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DEDICATED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

EQUIPMENT TRANSPORTATION - SHARED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency (ton-mpg)	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SHARED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
CO_2 emission factor (kg/ton mile)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
N_2O emission factor (g/ton mile)	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02
CH_4 emission factor (g/ton mile)	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02
NOx emission factor (g/ton mile)	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00
SOx emission factor (g/ton mile)	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01
PM_{10} emission factor (g/ton mile)	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**

Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02
CO_2 emission factor (kg/ton mile)	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02
N_2O emission factor (g/ton mile)	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04
CH_4 emission factor (g/ton mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/ton mile)	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01
SOx emission factor (g/ton mile)	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01
PM_{10} emission factor (g/ton mile)	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - WATER

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02
CO_2 emission factor (kg/ton mile)	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02
N_2O emission factor (g/ton mile)	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03
CH_4 emission factor (g/ton mile)	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04
NOx emission factor (g/ton mile)	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00
SOx emission factor (g/ton mile)	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01
PM_{10} emission factor (g/ton mile)	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM EQUIPMENT TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EARTHWORK EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Excavator	Excavator	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	5,800	5,800	250	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
Approximate net power (hp)	270	270	65	65	65	65	65	65	65	65	65	65
Production rate (yd^3/hr)	239	239	100	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	11	11	5	5	5	5	5	5	5	5	5	5
Equipment operating hours (hr)	35.4	35.4	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	382.7	382.7	25.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	9.40E+04	9.40E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	2.38E+00	2.38E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	5.40E+00	5.40E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	5.46E+02	5.46E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	1.49E+02	1.49E+02	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	4.50E+01	4.50E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	6.6E+01	6.6E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	3.5E+01	3.5E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	1.0E+01	1.0E+01	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	5.2E+07	5.2E+07	3.5E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	3.3E+00	3.3E+00	1.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	2.6E-02	2.6E-02	1.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	4.0E-03	4.0E-03	2.7E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	2.4E-03	2.4E-03	1.6E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	1.2E-03	1.2E-03	8.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	3.5E-04	3.5E-04	2.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	1.9E-02	1.9E-02	8.3E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	5.3E-03	5.3E-03	2.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	4.8E-04	4.8E-04	3.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	3.2E-06	3.2E-06	4.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	8.1E-04	8.1E-04	1.2E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BACKHOE, DOZER, AND SCRAPER OPERATION	
CO_2 e Emission (metric ton)	**6.9E+00**
Onsite NOx Emission (metric ton)	**4.0E-02**
Onsite SOx Emission (metric ton)	**1.1E-02**
Onsite PM_{10} Emission (metric ton)	**9.9E-04**
Offsite NOx Emission (metric ton)	**4.9E-03**
Offsite SOx Emission (metric ton)	**2.5E-03**
Offsite PM_{10} Emission (metric ton)	**7.3E-04**
Accident Risk - Fatality	**6.9E-06**
Accident Risk - Injury	**1.7E-03**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**1.1E+02**
Energy Used (MWh)	**NA**

WELL DRILLING EQUIPMENT

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12
Number of injection and extraction points/wells	0	0	0	0	0	0	0	0	0	0	0	0
Drilling method	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push
Drilling fuel consumption rate (gal/hr)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Time spent drilling each injection site (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Total time drilling well (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total fuel consumption during drilling (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (kg/gallon)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
N_2O emission factor (g/gal)	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01
CH_4 emission factor (g/gal)	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01
NOx emission factor (g/gal)	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02
SOx emission factor (g/gal)	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01
PM_{10} emission factor (g/gal)	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01
Offsite NOx emission factor (g/hr)	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00
Offsite SOx emission factor (g/hr)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
Offsite PM_{10} emission factor (g/hr)	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission from drilling (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	ACCIDENT RISK												
	Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DRILLING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRENCHING EQUIPMENT

	Trencher 1	**Trencher 2**	**Trencher 3**	**Trencher 4**	**Trencher 5**	**Trencher 6**	**Trencher 7**	**Trencher 8**	**Trencher 9**	**Trencher 10**	**Trencher 11**	**Trencher 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Equipment operating hours	0	0	0	0	0	0	0	0	0	0	0	0

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

SEDIMENT MANAGEMENT (STAGING AND DRYING)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Is volume input that of saturated sediment?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Will the sediment be dry when this work is performed?	No	No	No	No	No	No	No	No	No	No	No	No
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
Actual volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Approximate net power (hp)	175	175	175	175	175	175	175	175	175	175	175	175
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05
N_2O emission factor (g/hr)	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00
CH_4 emission factor (g/hr)	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00
Onsite NOx emission factor (g/hr)	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02
Onsite SOx emission factor (g/hr)	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02
Onsite PM_{10} emission factor (g/hr)	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01
Offsite NOx emission factor (g/hr)	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01
Offsite SOx emission factor (g/hr)	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01
Offsite PM_{10} emission factor (g/hr)	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SEDIMENT MANAGEMENT (STAGING AND DRYING)	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

This worksheet allows the user to calculate the environmental footprint of operating pumps on site

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

ELECTRIC PUMP OPERATION - For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pumps or unused methods

		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Method 1 - IF ELECTRICAL USAGE IS KNOWN													
	Pump electrical usage (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
Method 2 - IF PUMP HEAD IS KNOWN													
	Flow rate (gpm)	0	0	0	0	0	0	0	0	0	0	0	0
	Total head (ft)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Pump efficiency	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump times motor efficiency	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Specific gravity	1	1	1	1	1	1	1	1	1	1	1	1
	Pump horsepower (hp)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Method 3 - IF NAME PLATE SPECIFICATIONS ARE KNOWN													
	Pump horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Pump load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
SELECT REGION													
	Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
	CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
	N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
	CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
	NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
	SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
	PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
	Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
	ENERGY OUTPUT												
	Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx and SOx OUTPUT												
	NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRIC PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

DIESEL AND GASOLINE PUMPS

	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
Equipment operating hours (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02
N_2O emission factor (g/hr)	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02
CH_4 emission factor (g/hr)	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02
Onsite NOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00
Offsite NOx emission factor (g/hr)	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01

	Offsite SOx emission factor (g/hr)	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01
	Offsite PM_{10} emission factor (g/hr)	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02
	ENERGY OUTPUT												
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL AND GASOLINE PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM PUMP OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of using electrical equipment	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

Equipment Operation - For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Type of equipment	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower
Method 1 - IF NAME PLATE SPECIFICATIONS ARE KNOWN												
Equipment horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
Number of equipments operating	0	0	0	0	0	0	0	0	0	0	0	0
Operating time for each equipment (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Equipment load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - IF ELECTRICAL USAGE IS KNOWN												
Equipment electrical usage, if known (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
SELECT REGION												
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx and SOx OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRICAL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

GENERATORS

	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6	Generator 7	Generator 8	Generator 9	Generator 10	Generator 11	Generator 12
Fuel type	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	16 to 25	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Operating hours (hr)	3630	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5.29E-01	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02
Fuel used (gal)	1921.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.5E+03	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02
N_2O emission factor (g/hr)	1.5E-01	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02
CH_4 emission factor (g/hr)	8.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NOx emission factor (g/hr)	6.3E+01	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00
SOx emission factor (g/hr)	9.2E+00	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01
PM_{10} emission factor (g/hr)	7.2E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Offsite NOx emission factor (g/hr)	3.3E+00	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01
Offsite SOx emission factor (g/hr)	1.7E+00	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
Offsite PM_{10} emission factor (g/hr)	4.9E-01	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02
ENERGY OUTPUT												
Energy used (BTU)	2.6E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	2.4E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	1.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	6.1E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	1.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	6.2E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Offsite PM_{10} emission (metric ton)	1.8E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	2.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	2.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	2.4E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM GENERATOR OPERATION	
CO_2 e Emission (metric ton)	2.5E+01
Onsite NOx Emission (metric ton)	2.2E-01
Onsite SOx Emission (metric ton)	2.7E-02
Onsite PM_{10} Emission (metric ton)	2.4E-02
Offsite NOx Emission (metric ton)	1.2E-02
Offsite SOx Emission (metric ton)	6.2E-03
Offsite PM_{10} Emission (metric ton)	1.8E-03
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	2.6E+02
Energy Used (MWh)	NA

TOTAL FROM ELECTRICAL EQUIPMENT OPERATIONS	
CO_2 e Emission (metric ton)	2.5E+01
Onsite NOx Emission (metric ton)	2.2E-01
Onsite SOx Emission (metric ton)	2.7E-02
Onsite PM_{10} Emission (metric ton)	2.4E-02

This worksheet allows the user to calculate the environmental footprint of equipment use	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

AGRICULTURAL EQUIPMENT

	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6	Tillage Tractor 7	Tillage Tractor 8	Tillage Tractor 9	Tillage Tractor 10	Tillage Tractor 11	Tillage Tractor 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area to till (acre)	0	0	0	0	0	0	0	0	0	0	0	0
Soil condition	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil
Soil type	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of tillage (in)	0	0	0	0	0	0	0	0	0	0	0	0
Tractor horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tractor horsepower used	16	16	16	16	16	16	16	16	16	16	16	16
Consumption rate (gal/hr)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Actual equipment operating hours (hr), limited by tractor horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03
N_2O emission factor (g/hr)	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01
CH_4 emission factor (g/hr)	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00
NOx emission factor (g/hr)	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01
SOx emission factor (g/hr)	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00
PM_{10} emission factor (g/hr)	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00
Offsite NOx emission factor (g/hr)	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00
Offsite SOx emission factor (g/hr)	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00
Offsite PM_{10} emission factor (g/hr)	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TRACTOR AND TILLER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CAPPING EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Equipment type	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Calculated area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Actual equipment operating hours (hr), limited by machine horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower used	11	11	11	11	11	11	11	11	11	11	11	11
Consumption Rate (gal/hr)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03
N_2O emission factor (g/hr)	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01
CH_4 emission factor (g/hr)	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01
Onsite NOx emission factor (g/hr)	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01
Onsite SOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Offsite NOx emission factor (g/hr)	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00

Offsite SOx emission factor (g/hr)	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00
Offsite PM_{10} emission factor (g/hr)	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROLLER AND PAVER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

MIXING EQUIPMENT

	Mixer 1	**Mixer 2**	**Mixer 3**	**Mixer 4**	**Mixer 5**	**Mixer 6**	**Mixer 7**	**Mixer 8**	**Mixer 9**	**Mixer 10**	**Mixer 11**	**Mixer 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Volume (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
N_2O emission factor (g/hr)	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02
CH_4 emission factor (g/hr)	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01
Onsite NOx emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite NOx emission factor (g/hr)	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00
Offsite SOx emission factor (g/hr)	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01
Offsite PM_{10} emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM MIXER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**

Energy Used (MWh)	**NA**

INTERNAL COMBUSTION ENGINES

	Engine 1	Engine 2	Engine 3	Engine 4	Engine 5	Engine 6	Engine 7	Engine 8	Engine 9	Engine 10	Engine 11	Engine 12
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Estimated fuel consumption rate (gal or scf/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel used (gal or scf)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon or scf fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal or scf)	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04
N_2O emission factor (g/gal or scf)	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01
CH_4 emission factor (g/gal or scf)	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01
Onsite NOx emission factor (g/gal or scf)	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01
Onsite SOx emission factor (g/gal or scf)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/gal or scf)	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00
Offsite NOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM INTERNAL COMBUSTION ENGINE OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OTHER FUELED EQUIPMENT

	Fuel 1	Fuel 2	Fuel 3	Fuel 4	Fuel 5	Fuel 6	Fuel 7	Fuel 8	Fuel 9	Fuel 10	Fuel 11	Fuel 12
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Volume (scf for Natural gas, gallons for all others)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon or scf	983	983	983	983	983	983	983	983	983	983	983	983
CO2 emission factor (lb/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
N2O emission factor (lb/MMBTU)	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03
CH4 emission factor (lb/MMBTU)	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00
NOx emission factor (lb/MMBTU)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
SOx emission factor (lb/MMBTU)	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04
PM10 emission factor (lb/MMBTU)	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02
Offsite NOx emission factor (g/gal or scf)	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01
Offsite SOx emission factor (g/gal or scf)	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02
Offsite PM_{10} emission factor (g/gal or scf)	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OTHER FUELED EQUIPMENT	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

DIESEL EQUIPMENT (PER HOUR BASIS)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Choose equipment type from drop down menu	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Choose equipment size for Dozer (HP)	65	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1
Choose equipment size for Loader (HP)	65	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Choose equipment size for Excavator (HP)	150	150	150	150	150	150	150	150	150	150	150	150
Choose equipment size for Scraper (HP)	330	330	330	330	330	330	330	330	330	330	330	330
Choose equipment size for Crawler Crane	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1
Choose equipment size for Tillage Tractor (HP)	16	16	16	16	16	16	16	16	16	16	16	16
Choose equipment size for Paver (HP)	25	25	25	25	25	25	25	25	25	25	25	25
Choose equipment size for Roller (HP)	6	6	6	6	6	6	6	6	6	6	6	6
Choose equipment size for Trencher (HP range)	6 to 11	7 to 11	8 to 11	9 to 11	10 to 11	11 to 11	12 to 11	13 to 11	14 to 11	15 to 11	16 to 11	17 to 11
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate equipment size for earthwork equipment	65	65	65	65	65	65	65	65	65	65	65	65
Approximate equipment size for other equipment	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Corrected Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OPERATOR LABOR

	Occupation 1	Occupation 2	Occupation 3	Occupation 4	Occupation 5	Occupation 6	Occupation 7	Occupation 8	Occupation 9	Occupation 10	Occupation 11	Occupation 12
Occupation	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers
Total time worked onsite (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fatality risk per labor hour	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08
Injury risk per labor hour	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OPERATOR LABOR	
CO_2 e Emission (metric ton)	**NA**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	NA
Offsite SOx Emission (metric ton)	NA
Offsite PM_{10} Emission (metric ton)	NA
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (MMBTU)	NA
Energy Used (MWh)	NA

LABORATORY ANALYSIS

	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Analysis 5	Analysis 6	Analysis 7	Analysis 8	Analysis 9	Analysis 10	Analysis 11	Analysis 12
Dollars spent on laboratory analysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy used (MMBTU/$)	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03
CO2 e emission factor (lb/$)	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
NOx emission factor (lb/$)	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03

This worksheet allows the user to calculate the environmental footprint of residual handling

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

RESIDUE DISPOSAL/RECYCLING

	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No
Weight of the waste transported to landfill or recycling (tons)	20.0	30.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used	Diesel	Diesel	Gasoline	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Total number of trips	391.5	12.0	0.0	43.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of miles per trip	50.0	50.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total distance traveled (miles)	19575	600	0	4350	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	5.4	4.3	7.4	5.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	3657.5	138.6	0.0	812.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	139,015	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	9.84E+03	1.01E+04	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	2.09E-01	1.14E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.18E+01	1.14E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	1.33E-01	5.79E-02	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.65E-01	2.91E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	5.0E+08	1.9E+07	0.0E+00	1.1E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	3.7E+01	1.4E+00	0.0E+00	8.2E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	1.3E-01	4.9E-03	0.0E+00	2.9E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	8.8E-01	3.3E-02	0.0E+00	1.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	1.2E-02	4.5E-04	0.0E+00	2.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	2.1E-04	8.0E-06	0.0E+00	4.7E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	3.2E-04	1.2E-05	0.0E+00	7.1E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	1.5E-04	4.7E-06	0.0E+00	3.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	1.2E-02	3.8E-04	0.0E+00	2.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**4.8E+01**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**1.5E-02**
Offsite SOx Emission (metric ton)	**2.7E-04**
Offsite PM_{10} Emission (metric ton)	**4.0E-04**
Accident Risk - Fatality	**1.9E-04**
Accident Risk - Injury	**1.5E-02**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**6.3E+02**
Energy Used (MWh)	**NA**

LANDFILL OPERATIONS

	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6	Operation 7	Operation 8	Operation 9	Operation 10	Operation 11	Operation 12
Landfill type	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
Waste disposed in landfill (tons)	870	0	0	0	0	0	0	0	0	0	0	0
Landfill methane emissions (metric tons CH_4)	0	0	0	0	0	0	0	0	0	0	0	0
Waste disposed in non-hazardous landfill (tons)	870.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waste disposed in hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy used (MMBTU/ton)	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01
Electricity used (MWh/ton)	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03
CO_2 e emission factor (lb/ton)	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01
NOx emission factor (lb/ton)	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01
SOx emission factor (lb/ton)	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02
PM_{10} emission factor (lb/ton)	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (BTU)	1.9E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	9.9E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	5.5E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	3.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	1.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM LANDFILL OPERATIONS	
CO_2 e Emission (metric ton)	**9.9E+00**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	5.5E-02
Offsite SOx Emission (metric ton)	3.0E-02
Offsite PM_{10} Emission (metric ton)	1.6E-01
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	1.9E+02
Energy Used (MWh)	NA

THERMAL/CATALYTIC OXIDIZERS

	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6	Oxidizer 7	Oxidizer 8	Oxidizer 9	Oxidizer 10	Oxidizer 11	Oxidizer 12
Oxidizer type	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Waste gas flow rate (scfm)	0	0	0	0	0	0	0	0	0	0	0	0
Time running (hours)	0	0	0	0	0	0	0	0	0	0	0	0
Input waste gas inlet temperature (F)	0	0	0	0	0	0	0	0	0	0	0	0
Input contaminant concentration (ppmV)	0	0	0	0	0	0	0	0	0	0	0	0
Heat capacity at inlet (BTU/scf - F)	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179
Combustion temperature (F)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Heat exchanger efficiency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heating value for fuel (BTU/scf)	983	983	983	983	983	983	983	983	983	983	983	983
Waste inlet temp after heat exchanger (F)	0	0	0	0	0	0	0	0	0	0	0	0
Waste gas heat content (BTU/scf)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Supplemental heat required (BTU/min)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total fuel consumed (scf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO_2 emission factor (lb/MMBTU)	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02
N_2O emission factor (lb/MMBTU)	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03
CH_4 emission factor (lb/MMBTU)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
Onsite NOx emission factor (lb/MMBTU)	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00
Onsite SOx emission factor (lb/MMBTU)	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04
Onsite PM_{10} emission factor (lb/MMBTU)	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
Offsite NOx emission factor (g/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
Offsite SOx emission factor (g/MMBTU)	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Offsite PM_{10} emission factor (g/MMBTU)	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM THERMAL OXIDIZERS	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	5.8E+01
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	7.0E-02
Offsite SOx Emission (metric ton)	3.0E-02

This worksheet allows the user to calculate the water used and GHG emissions from onsite activities

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WATER CONSUMPTION

	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6	Treatment System 7	Treatment System 8	Treatment System 9	Treatment System 10	Treatment System 11	Treatment System 12
Water consumed from municipal water treatment facility (gal)	22000	0	0	0	0	0	0	0	0	0	0	0
Water disposed to wastewater treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Total water consumption (gal)	22000	0	0	0	0	0	0	0	0	0	0	0
Energy consumption (Btu/gal) for water treatment	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00
CO_2 e emission factor (kg/gal) for water treatment	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03
NOx emission factor (g/gal) for water treatment	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03
SOx emission factor (g/gal) for water treatment	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03
PM_{10} emission factor (g/gal) for water treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
Energy consumption (Btu/gal) for wastewater treatment	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01
CO_2 e emission factor (kg/gal) for wastewater treatment	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/gal) for wastewater treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
SOx emission factor (g/gal) for wastewater treatment	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03
PM10 emission factor (g/gal) for wastewater treatment	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04
ENERGY OUTPUT												
Energy used (BTU)	2.0E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	5.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	9.7E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	5.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	1.6E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER CONSUMPTION	
CO_2 e Emission (metric ton)	**5.0E-02**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**9.7E-05**
Offsite SOx Emission (metric ton)	**5.9E-05**
Offsite PM_{10} Emission (metric ton)	**1.6E-04**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gal)	**2.2E+04**
Energy Used (MMBTU)	**2.0E-01**
Energy Used (MWh)	**NA**

ONSITE LAND AND WATER RESOURCE CONSUMPTION

	Entire Site 1	Entire Site 2	Entire Site 3	Entire Site 4	Entire Site 5	Entire Site 6	Entire Site 7	Entire Site 8	Entire Site 9	Entire Site 10	Entire Site 11	Entire Site 12
Volume of topsoil brought to site (cubic yards)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of groundwater or surface water lost (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOTAL FROM ONSITE LAND AND WATER RESOURCE CONSUMPTION	
Topsoil consumption (yd^3)	**0.0E+00**
Water loss (gal)	**0.0E+00**

TOTAL FROM RESOURCE CONSUMPTION	
CO_2 e Emission (metric ton)	**5.0E-02**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**9.7E-05**
Offsite SOx Emission (metric ton)	**5.9E-05**
Offsite PM_{10} Emission (metric ton)	**1.6E-04**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Consumption (gal)	**2.2E+04**
Energy Used (MMBTU)	**2.0E-01**
Energy Used (MWh)	**NA**

Environmental Footprint Summary

Activities	CO_2 Emissions	Percent Total	Onsite NOx emissions	Percent Total	Onsite SOx Emissions	Percent Total	Onsite PM_{10} Emissions	Percent Total	Total NOx emissions	Percent Total	Total SOx Emissions	Percent Total	Total PM_{10} Emissions	Percent Total	Total Energy Used	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	MMBTU	%		%		%
Material Productions	90.99	48.91	NA	-	NA	-	NA	-	2.5E-01	42.6	4.2E-01	84.6	1.0E-01	35.0	1.0E+03	45.27	NA	NA	NA	NA
Transportation-Personnel	5.73	3.08	NA	-	NA	-	NA	-	2.1E-03	0.4	7.5E-05	0.0	4.3E-04	0.1	7.2E+01	3.1	1.2E-04	37.2	9.4E-03	35.5
Transportation-Equip/materials	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Equipment Use and Misc	31.47	16.92	2.5E-01	100.0	3.8E-02	100.0	2.5E-02	100.0	2.7E-01	45.4	4.7E-02	9.4	2.8E-02	9.8	3.7E+02	16.1	6.9E-06	2.2	1.7E-03	6.6
Residual Handling	57.84	31.09	0.0E+00	-	0.0E+00	-	0.0E+00	-	7.0E-02	11.7	3.0E-02	6.0	1.6E-01	55.1	8.1E+02	35.5	1.9E-04	60.6	1.5E-02	57.9
Total	186.03	100	2.55E-01	100.0	3.81E-02	100	2.54E-02	100	5.99E-01	100	4.98E-01	100	2.87E-01	100	2.29E+03	100	3.2E-04	100	2.7E-02	100

NA: Not Available or Not Applicable

Environmental Footprint Summary continued

Activities	Water Usage	Percent Total	Electrical Usage	Lost Hours - Injury	Percent Total
	gallons	%	MWH		%
Material Productions	NA	NA	NA	NA	NA
Transportation-Personnel	NA	NA	NA	7.6E-02	35.5
Transportation-Equipment	NA	NA	NA	0.0E+00	-
Equipment Use and Misc	22000.00	100.00	0.00E+00	1.4E-02	6.6
Residual Handling	NA	NA	NA	1.2E-01	57.9
Total	2.20E+04	100	0.00E+00	2.13E-01	100.0

Footprint Reduction

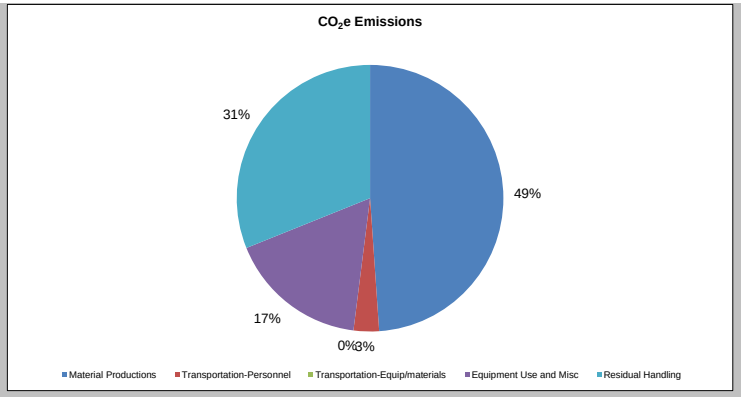
Total electricity replacement (MWh)	0.00E+00
Total electricity replacement (mmBtu)	0.00E+00
Percent electricity from renewable sources (%)	0.0%
Landfill gas reduction (metric ton CO_2 e)	0.00E+00
GHG emissions (metric ton CO2 e)	0.00E+00
NOx emissions (metric ton)	0.00E+00
SOx emissions (metric ton)	0.00E+00
PM10 emissions (metric ton)	0.00E+00
Water consumption reduction (gallons)	0.00E+00

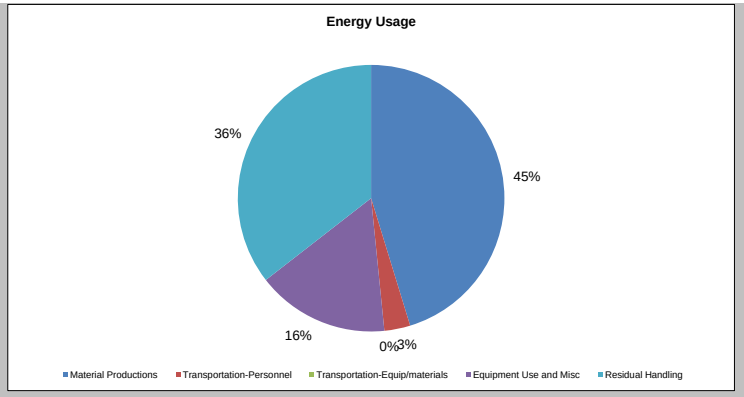
Additional Sustainability Metrics

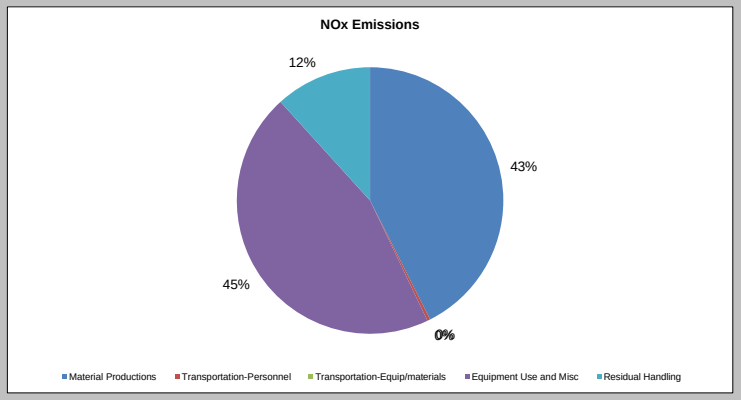
Non-Hazardous Waste Landfill Space (tons)	870.0
Hazardous Waste Landfill Space (tons)	0.0
Topsoil Consumption (yd^3)	0.0
Cost of Phase ($)	0.0
Lost Hours - Injury	0.2

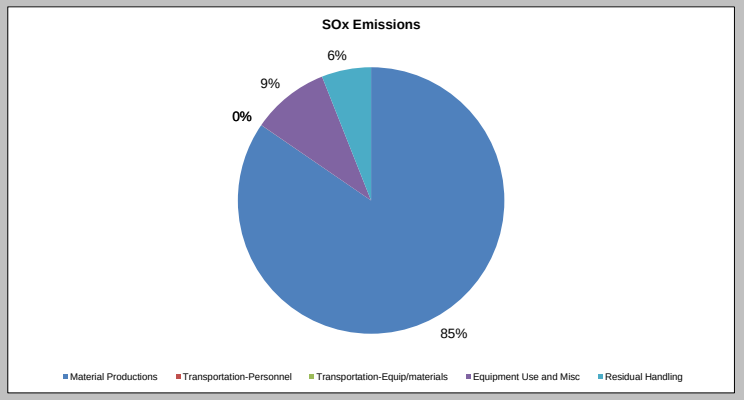
Duration of Phase

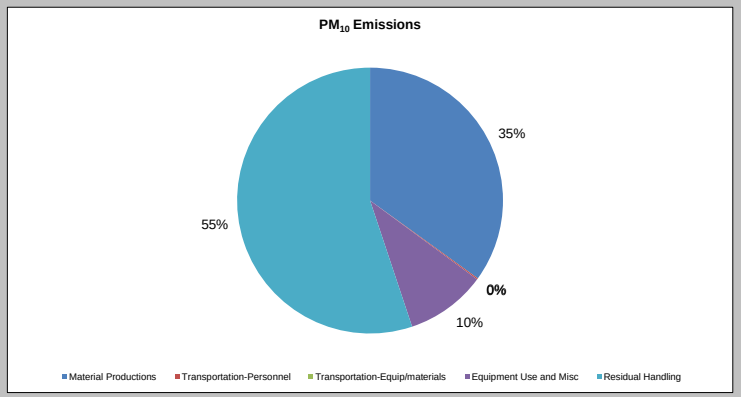
Duration (unit time)	1

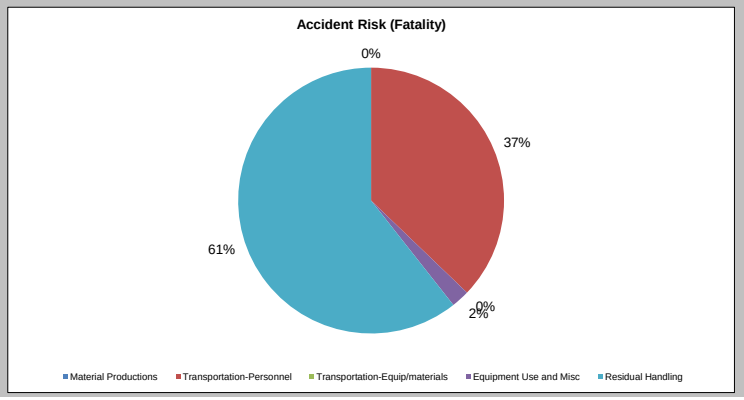

CO_2e Emissions
31%
49%
17%
0%
3%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

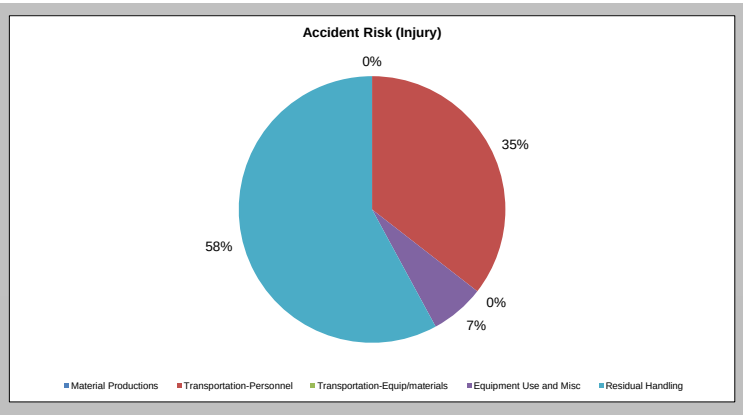

Energy Usage
36%
45%
16%
0%
3%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

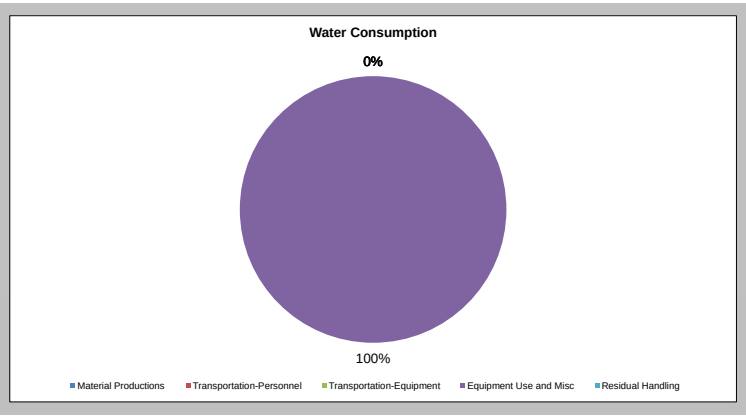

NOx Emissions
12%
43%
45%
0%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


SOx Emissions
6%
9%
0%
85%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


PM_{10} Emissions
35%
55%
0%
10%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Fatality)
0%
37%
61%
0%
2%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

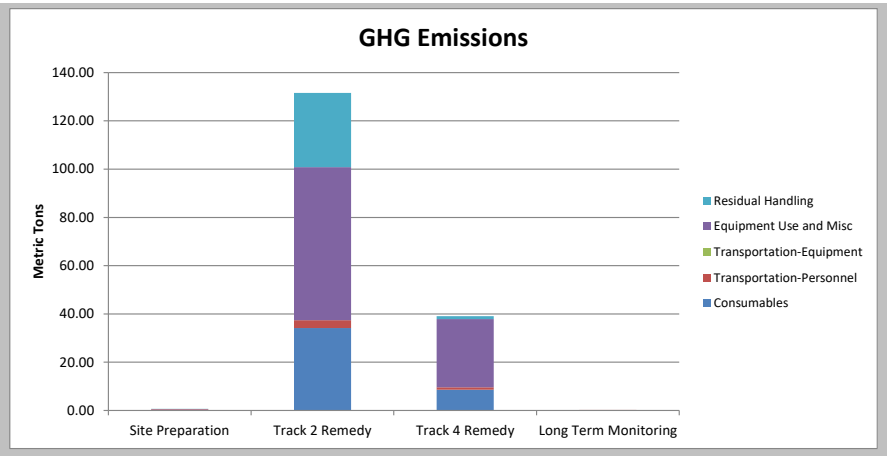

Accident Risk (Injury)
0%
35%
58%
0%
7%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

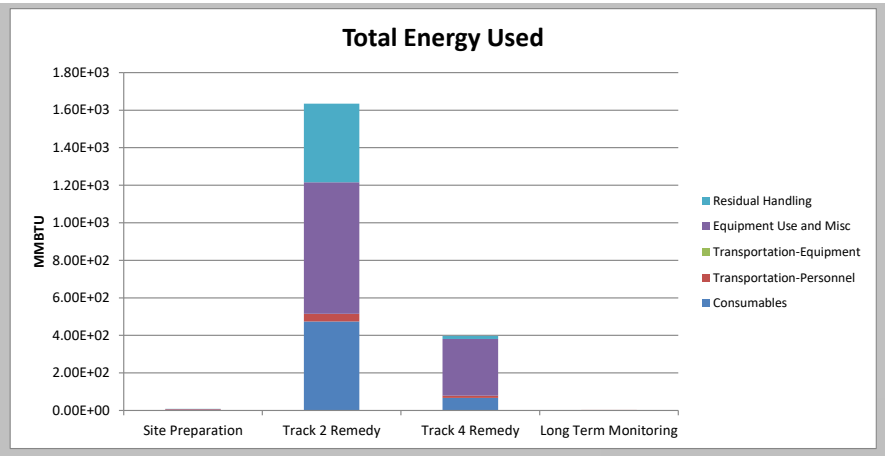

Water Consumption
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

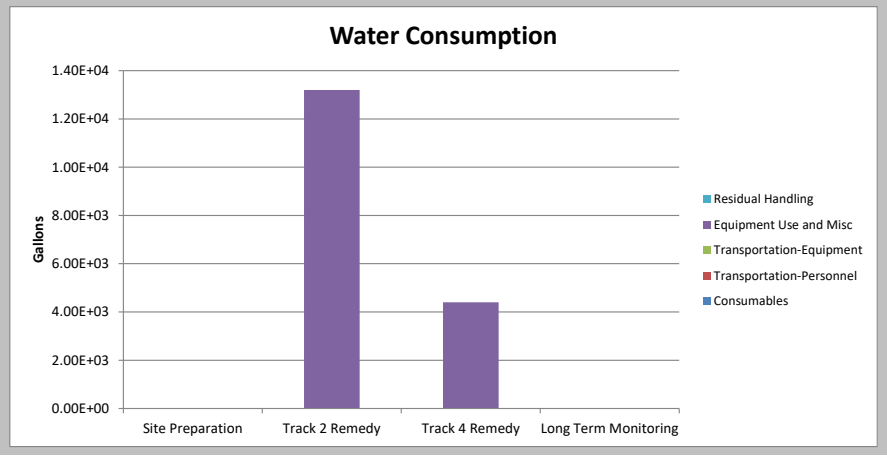
Sustainable Remediation - Environmental Footprint Summary
Alt II - Track 2/4

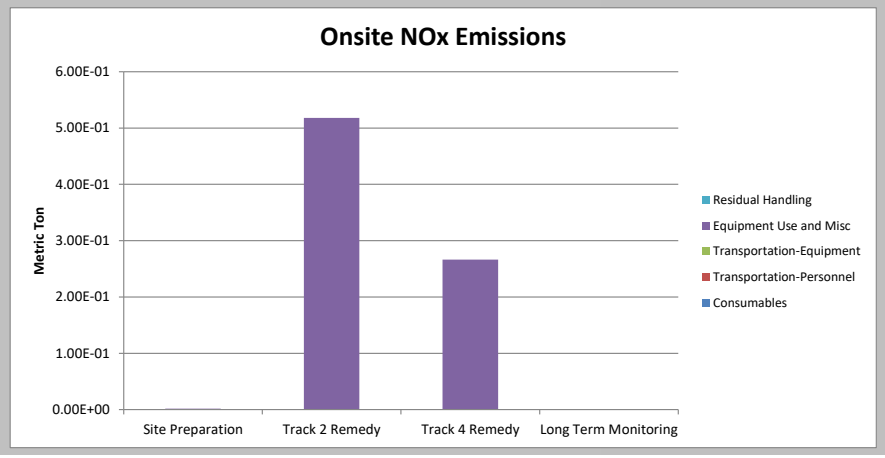
Phase	Activities	GHG Emissions	Total Energy Used	Water Consumption	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx Emissions	Total SOx Emissions	Total PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	MWH	metric ton	metric ton	metric ton	metric ton	metric ton	metric ton		
Site Preparation	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.45	5.8E+00	NA	NA	NA	NA	NA	1.6E-04	4.4E-06	2.1E-05	6.3E-06	5.1E-04
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.16	2.0E+00	0.0E+00	0.0E+00	1.5E-03	1.6E-04	1.4E-04	1.6E-03	2.0E-04	1.5E-04	1.6E-06	4.1E-04
	Residual Handling	0.07	9.8E-01	NA	NA	0.0E+00	0.0E+00	0.0E+00	2.3E-05	9.4E-07	1.9E-06	3.9E-07	3.1E-05
	Sub-Total	0.69	8.72E+00	0.00E+00	0.00E+00	1.55E-03	1.58E-04	1.39E-04	1.82E-03	2.10E-04	1.75E-04	8.36E-06	9.54E-04
Track 2 Remedy	Consumables	34.15	4.7E+02	NA	NA	NA	NA	NA	1.1E-01	1.7E-01	4.3E-02	NA	NA
	Transportation-Personnel	3.25	4.1E+01	NA	NA	NA	NA	NA	1.2E-03	4.2E-05	2.4E-04	6.7E-05	5.4E-03
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	63.39	7.0E+02	1.3E+04	0.0E+00	5.2E-01	7.2E-02	5.7E-02	5.5E-01	8.8E-02	6.2E-02	5.6E-06	1.4E-03
	Residual Handling	30.77	4.2E+02	NA	NA	0.0E+00	0.0E+00	0.0E+00	2.4E-02	8.5E-03	4.5E-02	1.1E-04	8.9E-03
	Sub-Total	131.57	1.63E+03	1.32E+04	0.00E+00	5.18E-01	7.18E-02	5.68E-02	6.87E-01	2.67E-01	1.50E-01	1.83E-04	1.57E-02
Track 4 Remedy	Consumables	8.58	6.7E+01	NA	NA	NA	NA	NA	1.9E-02	3.5E-02	7.7E-03	NA	NA
	Transportation-Personnel	1.00	1.3E+01	NA	NA	NA	NA	NA	3.7E-04	1.3E-05	7.5E-05	2.0E-05	1.6E-03
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	28.32	3.0E+02	4.4E+03	0.0E+00	2.7E-01	3.2E-02	2.0E-02	2.8E-01	3.9E-02	2.2E-02	1.4E-07	3.6E-05
	Residual Handling	1.20	1.6E+01	NA	NA	0.0E+00	0.0E+00	0.0E+00	9.8E-04	3.5E-04	1.8E-03	4.3E-06	3.5E-04
	Sub-Total	39.10	3.97E+02	4.40E+03	0.00E+00	2.66E-01	3.15E-02	2.04E-02	3.00E-01	7.41E-02	3.21E-02	2.49E-05	2.03E-03
Long Term Monitoring	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.23	2.9E+00	NA	NA	NA	NA	NA	8.5E-05	3.0E-06	1.7E-05	4.7E-06	3.8E-04
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.23	2.88E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.46E-05	2.98E-06	1.72E-05	4.68E-06	3.77E-04
Total		**1.7E+02**	**2.0E+03**	**1.8E+04**	**0.0E+00**	**7.9E-01**	**1.0E-01**	**7.7E-02**	**9.9E-01**	**3.4E-01**	**1.8E-01**	**2.2E-04**	**1.9E-02**

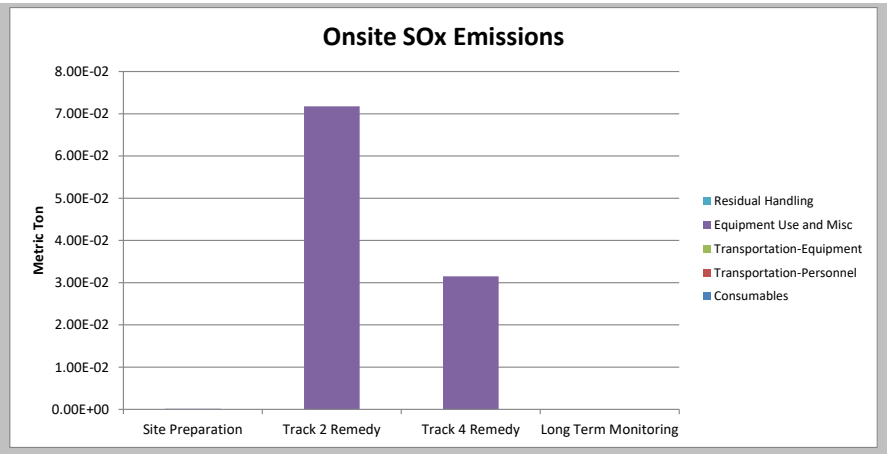
Remedial Alternative Phase	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury	Percent electricity from renewable sources	Total Cost with Footprint Reduction
	tons	tons	cubic yards	$		%	
Site Preparation	0.0E+00	0.0E+00	0.0E+00	0	7.6E-03	0.0%	$0
Track 2 Remedy	2.4E+02	0.0E+00	0.0E+00	0	1.3E-01	0.0%	
Track 4 Remedy	1.0E+01	0.0E+00	0.0E+00	0	1.6E-02	0.0%	
Long Term Monitoring	0.0E+00	0.0E+00	0.0E+00	0	3.0E-03	0.0%	
Total	**2.6E+02**	**0.0E+00**	**0.0E+00**	**$0**	**1.5E-01**	**0.0%**	

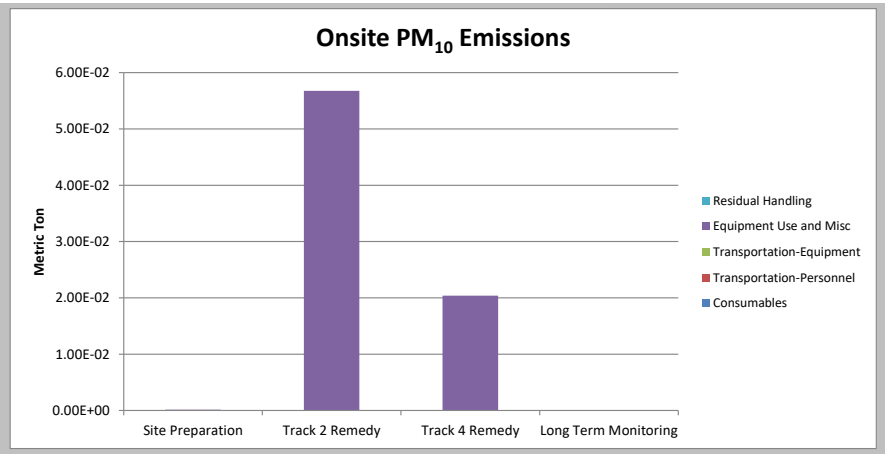

GHG Emissions
Metric Tons
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

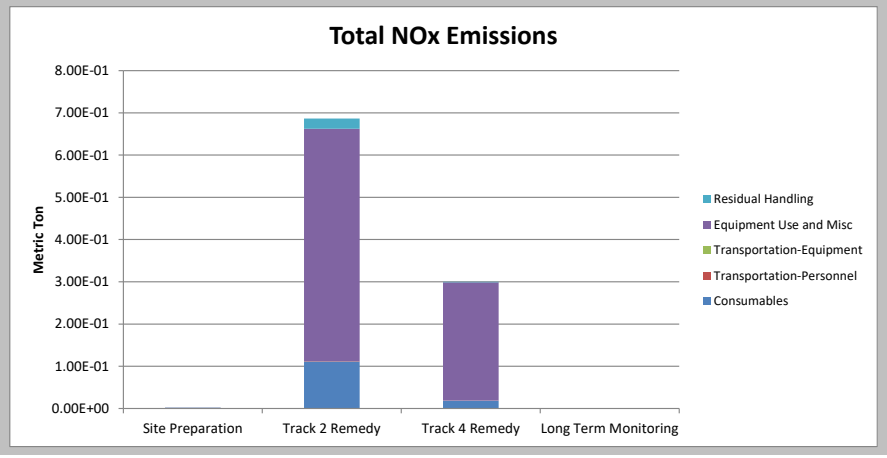

Total Energy Used
MMBTU
1.80E+03
1.60E+03
1.40E+03
1.20E+03
1.00E+03
8.00E+02
6.00E+02
4.00E+02
2.00E+02
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

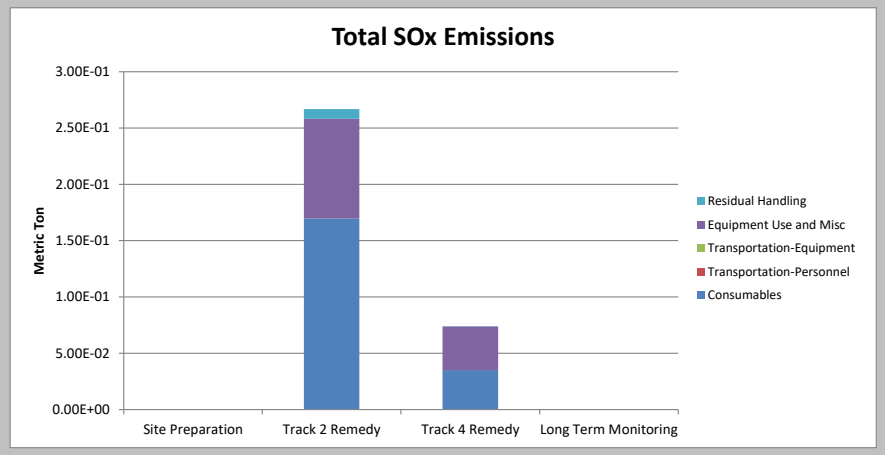

Water Consumption
Gallons
1.40E+04
1.20E+04
1.00E+04
8.00E+03
6.00E+03
4.00E+03
2.00E+03
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

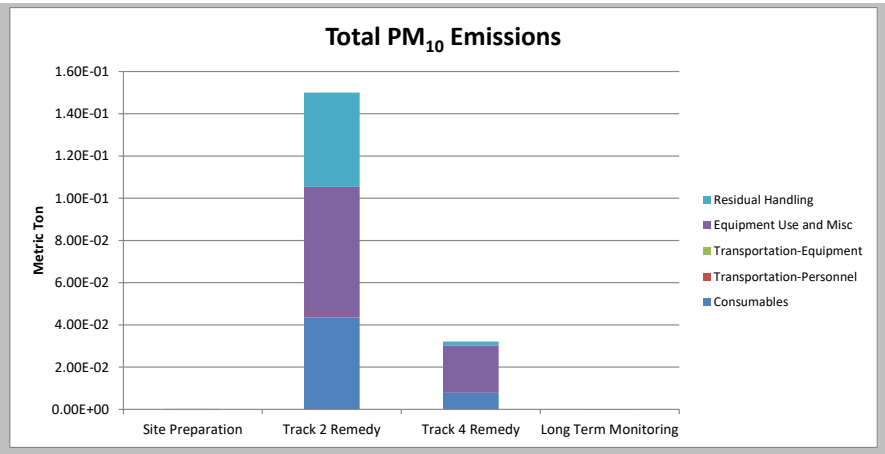

Onsite NOx Emissions
Metric Ton
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

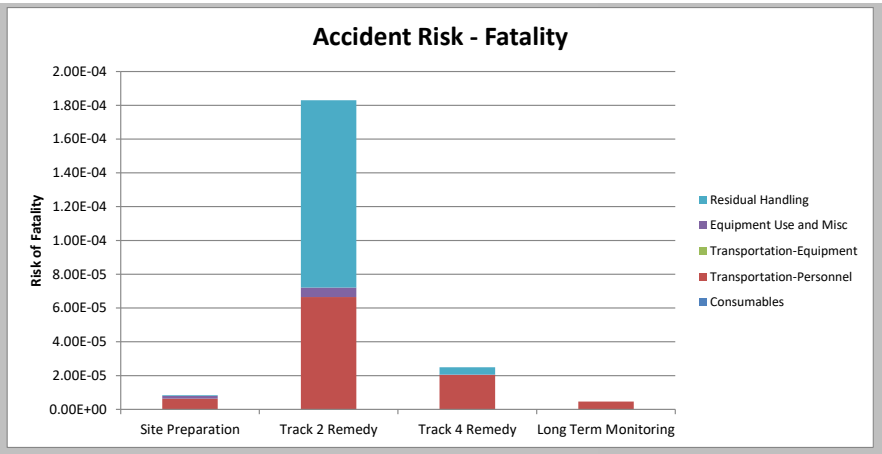

Onsite SOx Emissions
Metric Ton
8.00E-02
7.00E-02
6.00E-02
5.00E-02
4.00E-02
3.00E-02
2.00E-02
1.00E-02
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

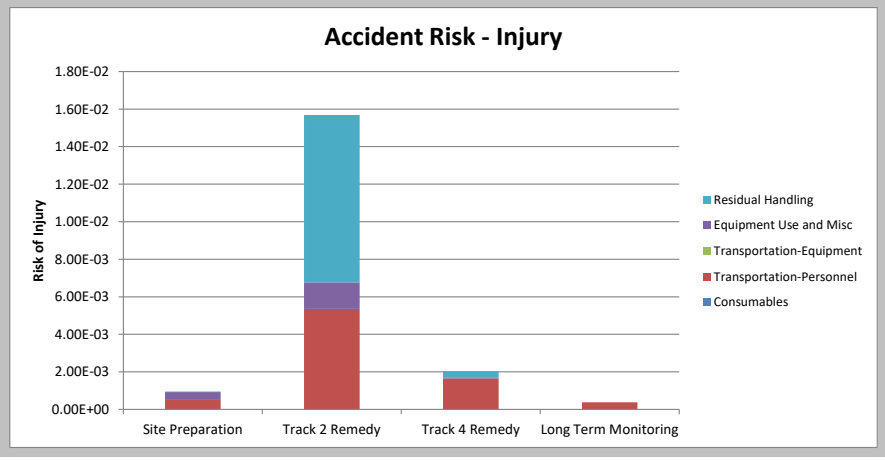

Onsite PM10 Emissions
Metric Ton
6.00E-02
5.00E-02
4.00E-02
3.00E-02
2.00E-02
1.00E-02
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

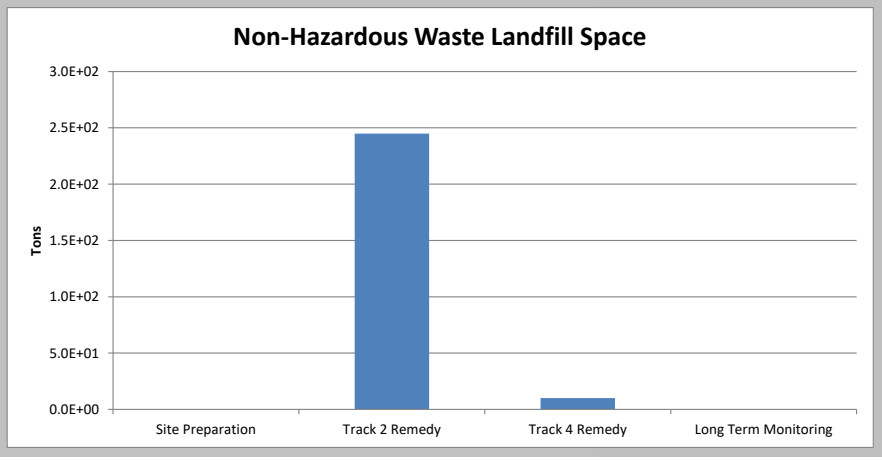

Total NOx Emissions
Metric Ton
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

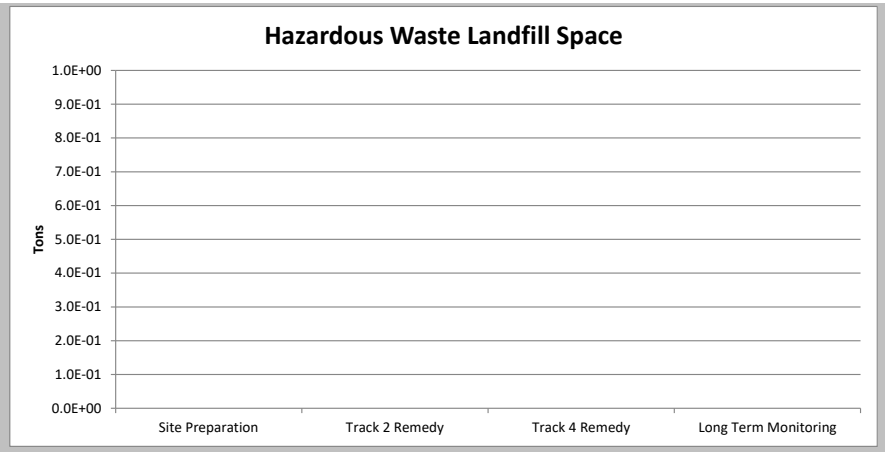

Total SOx Emissions
Metric Ton
3.00E-01
2.50E-01
2.00E-01
1.50E-01
1.00E-01
5.00E-02
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

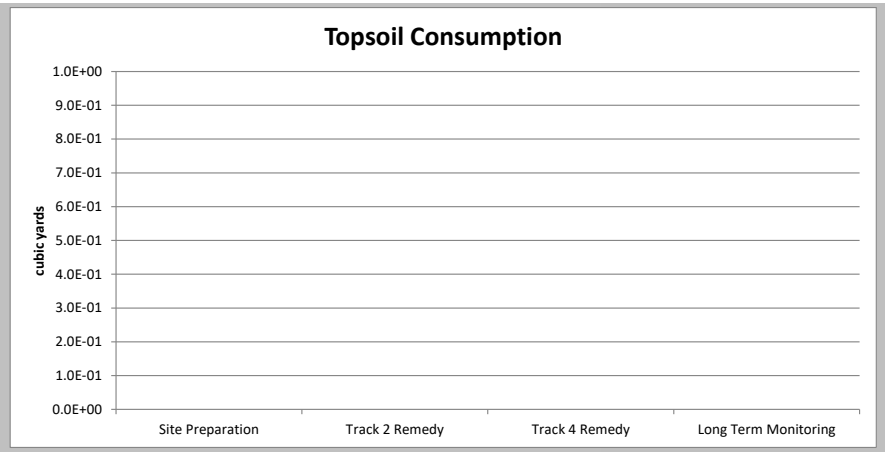

Total PM10 Emissions
Metric Ton
1.60E-01
1.40E-01
1.20E-01
1.00E-01
8.00E-02
6.00E-02
4.00E-02
2.00E-02
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

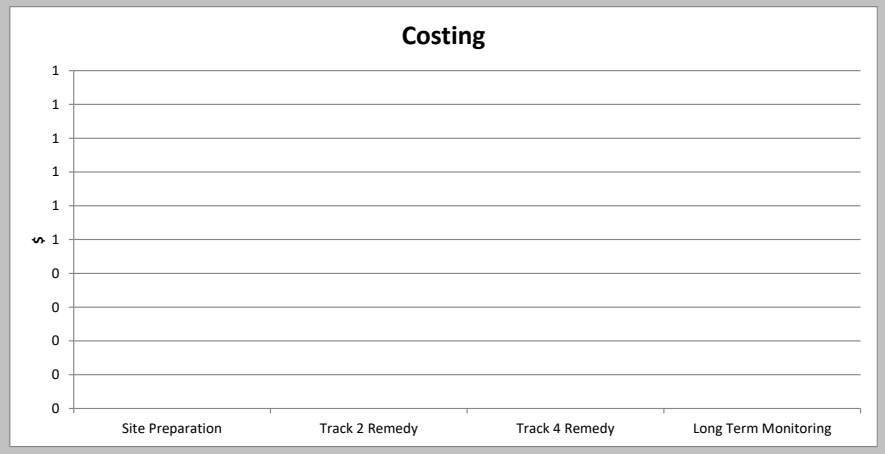

Accident Risk - Fatality
Risk of Fatality
2.00E-04
1.80E-04
1.60E-04
1.40E-04
1.20E-04
1.00E-04
8.00E-05
6.00E-05
4.00E-05
2.00E-05
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

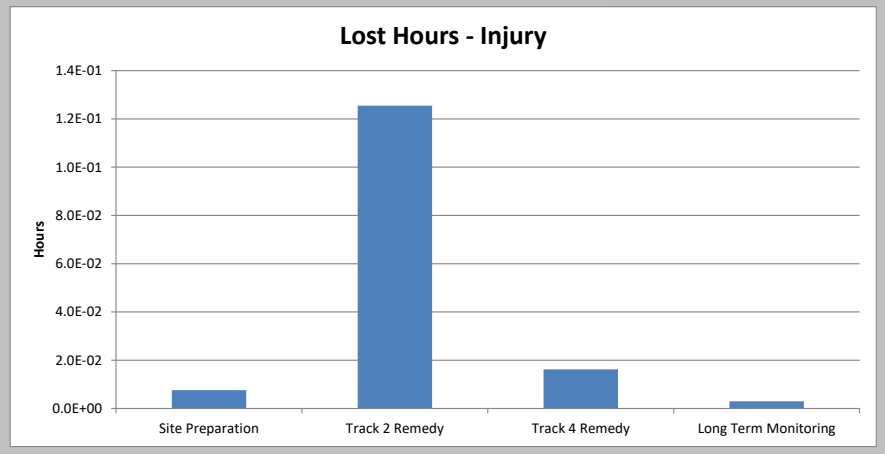

Accident Risk - Injury
Risk of Injury
1.80E-02
1.60E-02
1.40E-02
1.20E-02
1.00E-02
8.00E-03
6.00E-03
4.00E-03
2.00E-03
0.00E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Non-Hazardous Waste Landfill Space
Tons
3.0E+02
2.5E+02
2.0E+02
1.5E+02
1.0E+02
5.0E+01
0.0E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring


Hazardous Waste Landfill Space
Tons
1.0E+00
9.0E-01
8.0E-01
7.0E-01
6.0E-01
5.0E-01
4.0E-01
3.0E-01
2.0E-01
1.0E-01
0.0E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring


Topsoil Consumption
cubic yards
1.0E+00
9.0E-01
8.0E-01
7.0E-01
6.0E-01
5.0E-01
4.0E-01
3.0E-01
2.0E-01
1.0E-01
0.0E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring


Costing
$
1
1
1
1
1
1
0
0
0
0
0
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring


Lost Hours - Injury
Hours
1.4E-01
1.2E-01
1.0E-01
8.0E-02
6.0E-02
4.0E-02
2.0E-02
0.0E+00
Site Preparation
Track 2 Remedy
Track 4 Remedy
Long Term Monitoring

This worksheet allows the user to calculate the life cycle environmental footprint of the materials used

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WELL MATERIALS

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Specific casing material schedule	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Well diameter from drop down menu (in)	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Total weight of Sand (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Gravel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Bentonite (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Typical Cement (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of General Concrete (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Steel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Casing material type	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Weight of casing material (lb/ft)	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02
Total length of casing material required (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00
NOx emission factor (g/kg)	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
SOx emission factor (g/kg)	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00
PM_{10} emission factor (g/kg)	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00
MJ/kg material	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT CHEMICALS & MATERIALS

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Number of injection points	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Amount of material injected at each point (lbs dry mass)	0	0	0	0	0	0	0	0	0	0	0	0
Number of injections per injection point	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of injected material (lbs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total weight of injected material (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00
NOx emission factor (g/kg)	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00
SOx emission factor (g/kg)	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00
PM_{10} emission factor (g/kg)	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00
MJ/kg material	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT CHEMICALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT MEDIA

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Weight of media used (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC
Total weight of media (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00
NOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
SOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
PM10 emission factor (g/kg)	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04
MJ/kg material	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT MEDIA PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CONSTRUCTION MATERIALS

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner
Area of material (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of material (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00
NOx emission factor (g/kg)	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00
SOx emission factor (g/kg)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
PM10 emission factor (g/kg)	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00
MJ/kg material	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM CONSTRUCTION MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**

Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

WELL DECOMMISSIONING

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Well diameter (in)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of well (ft^3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Total volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02
NOx emission factor (g/kg)	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02
SOx emission factor (g/kg)	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01
PM10 emission factor (g/kg)	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02
MJ/kg material	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DECOMMISSIONING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

SILT CURTAIN MATERIALS

	CURTAIN 1	CURTAIN 2	CURTAIN 3	CURTAIN 4	CURTAIN 5	CURTAIN 6	CURTAIN 7	CURTAIN 8	CURTAIN 9	CURTAIN 10	CURTAIN 11	CURTAIN 12
Input length or perimeter of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Input depth of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Area of material required (ft^2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/ft^2 material)	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01
NOx emission factor (g/ft^3)	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01
SOx emission factor (g/ft^3)	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01
PM10 emission factor (g/ft^3)	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02
MJ/ft^2 material	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
CO_2 e emission factor (kg CO_2/linear ft material)	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00
NOx emission factor (g/linear ft)	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00
SOx emission factor (g/linear ft)	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00
PM10 emission factor (g/linear ft)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
MJ/linear ft material	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SILT CURTAIN MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

BULK MATERIAL QUANTITIES

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid
Units of quantity	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
Quantity	0	0	0	0	0	0	0	0	0	0	0	0
Density of material (kg/m^3)	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
NOx emission factor (g/kg)	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00
SOx emission factor (g/kg)	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00
PM10 emission factor (g/kg)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
MJ/kg material	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BULK MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM MATERIAL PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**

This worksheet allows the user to calculate the environmental footprint of personnel travel

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

TRANSPORTATION - ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle type	Cars	Heavy Duty	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
Fuel used	Gasoline	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Distance traveled per trip (miles)	60	70	100	130	0	0	0	0	0	0	0	0
Number of trips taken	3	2	1	3	0	0	0	0	0	0	0	0
Number of travelers	1	1	1	1	0	0	0	0	0	0	0	0
Total distance traveled (miles)	180	140	100	390	0	0	0	0	0	0	0	0
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	Yes	No	No	No	No	No	No	No	No	No	No
Consumption rate (MPG)	29	7.4	29	29	29	29	29	29	29	29	29	29
Estimated MPG (input the default if not known)	0	0	0	0	0	0	0	0	0	0	0	0
Total fuel used (gallons)	6.2	18.9	3.4	13.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/mile)	3.67E+02	1.37E+03	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02
N_2O emission factor (g/mile)	1.65E-02	1.54E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02
CH_4 emission factor (g/mile)	4.46E-01	1.54E+00	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01
NOx emission factor (g/mile)	1.41E-01	4.42E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01
SOx emission factor (g/mile)	4.97E-03	7.82E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03
PM_{10} emission factor (g/mile)	2.86E-02	3.93E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02
ENERGY OUTPUT												
Energy used (BTU)	8.6E+05	2.6E+06	4.8E+05	1.9E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	6.6E-02	1.9E-01	3.7E-02	1.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	9.2E-04	6.7E-04	5.1E-04	2.0E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	1.7E-03	4.5E-03	9.4E-04	3.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	2.5E-05	6.2E-05	1.4E-05	5.5E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	8.9E-07	1.1E-06	5.0E-07	1.9E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	5.1E-06	1.7E-06	2.9E-06	1.1E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	1.4E-06	1.1E-06	7.8E-07	3.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	1.1E-04	8.8E-05	6.3E-05	2.4E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**4.5E-01**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**1.6E-04**
Offsite SOx Emission (metric ton)	**4.4E-06**
Offsite PM_{10} Emission (metric ton)	**2.1E-05**
Accident Risk - Fatality	**6.3E-06**
Accident Risk - Injury	**5.1E-04**
Water Used (gallons)	**NA**
Energy Used (BTU)	**5.8E+06**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Number of flights taken	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843
CO_2 emission factor (kg/passenger mile)	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01
N_2O emission factor (g/passenger mile)	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03
CH_4 emission factor (g/passenger mile)	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02
NOx emission factor (g/passenger mile)	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01
SO_2 emission factor (g/passenger mile)	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02
PM_{10} emission factor (g/passenger mile)	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Type of rail used	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of trips taken	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
CO_2 emission factor (kg/passenger mile)	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01
N_2O emission factor (g/passenger mile)	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
CH_4 emission factor (g/passenger mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/passenger mile)	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02
SOx emission factor (g/passenger mile)	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01
PM_{10} emission factor (g/passenger mile)	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**

Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (BTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM PERSONNEL TRANSPORTATION	
CO_2 e Emission (metric ton)	4.5E-01
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	1.6E-04
Offsite SOx Emission (metric ton)	4.4E-06

This worksheet allows the user to calculate the environmental footprint of equipment and material transport	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EQUIPMENT TRANSPORTATION - DEDICATED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Account for an empty return trip?	No	No	No	No	No	No	No	No	No	No	No	No
Distance travelled (mi)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DEDICATED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

EQUIPMENT TRANSPORTATION - SHARED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency (ton-mpg)	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SHARED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
CO_2 emission factor (kg/ton mile)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
N_2O emission factor (g/ton mile)	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02
CH_4 emission factor (g/ton mile)	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02
NOx emission factor (g/ton mile)	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00
SOx emission factor (g/ton mile)	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01
PM_{10} emission factor (g/ton mile)	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**

Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02
CO_2 emission factor (kg/ton mile)	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02
N_2O emission factor (g/ton mile)	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04
CH_4 emission factor (g/ton mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/ton mile)	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01
SOx emission factor (g/ton mile)	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01
PM_{10} emission factor (g/ton mile)	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - WATER

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02
CO_2 emission factor (kg/ton mile)	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02
N_2O emission factor (g/ton mile)	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03
CH_4 emission factor (g/ton mile)	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04
NOx emission factor (g/ton mile)	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00
SOx emission factor (g/ton mile)	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01
PM_{10} emission factor (g/ton mile)	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM EQUIPMENT TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EARTHWORK EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate net power (hp)	65	65	65	65	65	65	65	65	65	65	65	65
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BACKHOE, DOZER, AND SCRAPER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

WELL DRILLING EQUIPMENT

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12
Number of injection and extraction points/wells	12	0	0	0	0	0	0	0	0	0	0	0
Drilling method	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push
Drilling fuel consumption rate (gal/hr)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Time spent drilling each injection site (hr)	1.5	0	0	0	0	0	0	0	0	0	0	0
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Total time drilling well (hr)	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total fuel consumption during drilling (gal)	14.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (kg/gallon)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
N_2O emission factor (g/gal)	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01
CH_4 emission factor (g/gal)	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01
NOx emission factor (g/gal)	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02
SOx emission factor (g/gal)	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01
PM_{10} emission factor (g/gal)	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01
Offsite NOx emission factor (g/hr)	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00
Offsite SOx emission factor (g/hr)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
Offsite PM_{10} emission factor (g/hr)	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01
ENERGY OUTPUT												
Energy used (BTU)	2.0E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission from drilling (metric ton)	1.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

	N_2O emission (metric ton CO_2 e)	5.5E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	3.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	8.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	4.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	1.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	1.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	1.6E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	1.4E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	ACCIDENT RISK												
	Fatality risk	1.6E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Injury risk	4.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DRILLING	
CO_2 e Emission (metric ton)	**1.6E-01**
Onsite NOx Emission (metric ton)	**1.5E-03**
Onsite SOx Emission (metric ton)	**1.6E-04**
Onsite PM_{10} Emission (metric ton)	**1.4E-04**
Offsite NOx Emission (metric ton)	**8.9E-05**
Offsite SOx Emission (metric ton)	**4.6E-05**
Offsite PM_{10} Emission (metric ton)	**1.3E-05**
Accident Risk - Fatality	**1.6E-06**
Accident Risk - Injury	**4.1E-04**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**2.0E+00**
Energy Used (MWh)	**NA**

TRENCHING EQUIPMENT

	Trencher 1	**Trencher 2**	**Trencher 3**	**Trencher 4**	**Trencher 5**	**Trencher 6**	**Trencher 7**	**Trencher 8**	**Trencher 9**	**Trencher 10**	**Trencher 11**	**Trencher 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Equipment operating hours	0	0	0	0	0	0	0	0	0	0	0	0

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

SEDIMENT MANAGEMENT (STAGING AND DRYING)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Is volume input that of saturated sediment?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Will the sediment be dry when this work is performed?	No	No	No	No	No	No	No	No	No	No	No	No
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Actual volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Approximate net power (hp)	175	175	175	175	175	175	175	175	175	175	175	175
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05
N_2O emission factor (g/hr)	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00
CH_4 emission factor (g/hr)	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00
Onsite NOx emission factor (g/hr)	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02
Onsite SOx emission factor (g/hr)	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02
Onsite PM_{10} emission factor (g/hr)	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01
Offsite NOx emission factor (g/hr)	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01
Offsite SOx emission factor (g/hr)	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01
Offsite PM_{10} emission factor (g/hr)	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SEDIMENT MANAGEMENT (STAGING AND DRYING)	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

This worksheet allows the user to calculate the environmental footprint of operating pumps on site

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

ELECTRIC PUMP OPERATION - For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pumps or unused methods

		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Method 1 - IF ELECTRICAL USAGE IS KNOWN													
	Pump electrical usage (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
Method 2 - IF PUMP HEAD IS KNOWN													
	Flow rate (gpm)	0	0	0	0	0	0	0	0	0	0	0	0
	Total head (ft)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Pump efficiency	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump times motor efficiency	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Specific gravity	1	1	1	1	1	1	1	1	1	1	1	1
	Pump horsepower (hp)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Method 3 - IF NAME PLATE SPECIFICATIONS ARE KNOWN													
	Pump horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Pump load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
SELECT REGION													
	Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
	CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
	N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
	CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
	NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
	SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
	PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
	Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
	ENERGY OUTPUT												
	Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx and SOx OUTPUT												
	NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRIC PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

DIESEL AND GASOLINE PUMPS

	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
Equipment operating hours (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02
N_2O emission factor (g/hr)	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02
CH_4 emission factor (g/hr)	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02
Onsite NOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00
Offsite NOx emission factor (g/hr)	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01

	Offsite SOx emission factor (g/hr)	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01
	Offsite PM_{10} emission factor (g/hr)	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02
	ENERGY OUTPUT												
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL AND GASOLINE PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM PUMP OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of using electrical equipment	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

Equipment Operation - For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Type of equipment	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower
Method 1 - IF NAME PLATE SPECIFICATIONS ARE KNOWN												
Equipment horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
Number of equipments operating	0	0	0	0	0	0	0	0	0	0	0	0
Operating time for each equipment (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Equipment load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - IF ELECTRICAL USAGE IS KNOWN												
Equipment electrical usage, if known (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
SELECT REGION												
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx and SOx OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRICAL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

GENERATORS

	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6	Generator 7	Generator 8	Generator 9	Generator 10	Generator 11	Generator 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02
N_2O emission factor (g/hr)	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02
CH_4 emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NOx emission factor (g/hr)	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00
SOx emission factor (g/hr)	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01
PM_{10} emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Offsite NOx emission factor (g/hr)	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01
Offsite SOx emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
Offsite PM_{10} emission factor (g/hr)	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM GENERATOR OPERATION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM ELECTRICAL EQUIPMENT OPERATIONS	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00

This worksheet allows the user to calculate the environmental footprint of equipment use	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

AGRICULTURAL EQUIPMENT

	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6	Tillage Tractor 7	Tillage Tractor 8	Tillage Tractor 9	Tillage Tractor 10	Tillage Tractor 11	Tillage Tractor 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area to till (acre)	0	0	0	0	0	0	0	0	0	0	0	0
Soil condition	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil
Soil type	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of tillage (in)	0	0	0	0	0	0	0	0	0	0	0	0
Tractor horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tractor horsepower used	16	16	16	16	16	16	16	16	16	16	16	16
Consumption rate (gal/hr)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Actual equipment operating hours (hr), limited by tractor horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03
N_2O emission factor (g/hr)	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01
CH_4 emission factor (g/hr)	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00
NOx emission factor (g/hr)	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01
SOx emission factor (g/hr)	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00
PM_{10} emission factor (g/hr)	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00
Offsite NOx emission factor (g/hr)	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00
Offsite SOx emission factor (g/hr)	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00
Offsite PM_{10} emission factor (g/hr)	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TRACTOR AND TILLER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CAPPING EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Equipment type	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Calculated area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Actual equipment operating hours (hr), limited by machine horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower used	11	11	11	11	11	11	11	11	11	11	11	11
Consumption Rate (gal/hr)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03
N_2O emission factor (g/hr)	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01
CH_4 emission factor (g/hr)	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01
Onsite NOx emission factor (g/hr)	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01
Onsite SOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Offsite NOx emission factor (g/hr)	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00

Offsite SOx emission factor (g/hr)	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00
Offsite PM_{10} emission factor (g/hr)	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROLLER AND PAVER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

MIXING EQUIPMENT

	Mixer 1	**Mixer 2**	**Mixer 3**	**Mixer 4**	**Mixer 5**	**Mixer 6**	**Mixer 7**	**Mixer 8**	**Mixer 9**	**Mixer 10**	**Mixer 11**	**Mixer 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Volume (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
N_2O emission factor (g/hr)	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02
CH_4 emission factor (g/hr)	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01
Onsite NOx emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite NOx emission factor (g/hr)	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00
Offsite SOx emission factor (g/hr)	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01
Offsite PM_{10} emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM MIXER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**

Energy Used (MWh)	**NA**

INTERNAL COMBUSTION ENGINES

	Engine 1	Engine 2	Engine 3	Engine 4	Engine 5	Engine 6	Engine 7	Engine 8	Engine 9	Engine 10	Engine 11	Engine 12
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Estimated fuel consumption rate (gal or scf/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel used (gal or scf)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon or scf fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal or scf)	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04
N_2O emission factor (g/gal or scf)	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01
CH_4 emission factor (g/gal or scf)	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01
Onsite NOx emission factor (g/gal or scf)	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01
Onsite SOx emission factor (g/gal or scf)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/gal or scf)	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00
Offsite NOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM INTERNAL COMBUSTION ENGINE OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OTHER FUELED EQUIPMENT

	Fuel 1	Fuel 2	Fuel 3	Fuel 4	Fuel 5	Fuel 6	Fuel 7	Fuel 8	Fuel 9	Fuel 10	Fuel 11	Fuel 12
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Volume (scf for Natural gas, gallons for all others)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon or scf	983	983	983	983	983	983	983	983	983	983	983	983
CO2 emission factor (lb/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
N2O emission factor (lb/MMBTU)	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03
CH4 emission factor (lb/MMBTU)	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00
NOx emission factor (lb/MMBTU)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
SOx emission factor (lb/MMBTU)	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04
PM10 emission factor (lb/MMBTU)	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02
Offsite NOx emission factor (g/gal or scf)	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01
Offsite SOx emission factor (g/gal or scf)	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02
Offsite PM_{10} emission factor (g/gal or scf)	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OTHER FUELED EQUIPMENT	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

DIESEL EQUIPMENT (PER HOUR BASIS)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Choose equipment type from drop down menu	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Choose equipment size for Dozer (HP)	65	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1
Choose equipment size for Loader (HP)	65	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Choose equipment size for Excavator (HP)	150	150	150	150	150	150	150	150	150	150	150	150
Choose equipment size for Scraper (HP)	330	330	330	330	330	330	330	330	330	330	330	330
Choose equipment size for Crawler Crane	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1
Choose equipment size for Tillage Tractor (HP)	16	16	16	16	16	16	16	16	16	16	16	16
Choose equipment size for Paver (HP)	25	25	25	25	25	25	25	25	25	25	25	25
Choose equipment size for Roller (HP)	6	6	6	6	6	6	6	6	6	6	6	6
Choose equipment size for Trencher (HP range)	6 to 11	7 to 11	8 to 11	9 to 11	10 to 11	11 to 11	12 to 11	13 to 11	14 to 11	15 to 11	16 to 11	17 to 11
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate equipment size for earthwork equipment	65	65	65	65	65	65	65	65	65	65	65	65
Approximate equipment size for other equipment	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Corrected Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OPERATOR LABOR

	Occupation 1	Occupation 2	Occupation 3	Occupation 4	Occupation 5	Occupation 6	Occupation 7	Occupation 8	Occupation 9	Occupation 10	Occupation 11	Occupation 12
Occupation	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers
Total time worked onsite (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fatality risk per labor hour	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08
Injury risk per labor hour	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OPERATOR LABOR	
CO_2 e Emission (metric ton)	**NA**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	NA
Offsite SOx Emission (metric ton)	NA
Offsite PM_{10} Emission (metric ton)	NA
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (MMBTU)	NA
Energy Used (MWh)	NA

LABORATORY ANALYSIS

	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Analysis 5	Analysis 6	Analysis 7	Analysis 8	Analysis 9	Analysis 10	Analysis 11	Analysis 12
Dollars spent on laboratory analysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy used (MMBTU/$)	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03
CO2 e emission factor (lb/$)	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
NOx emission factor (lb/$)	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03

This worksheet allows the user to calculate the environmental footprint of residual handling

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

RESIDUE DISPOSAL/RECYCLING

	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	Yes	No	No	No	No	No	No	No	No	No	No	No
Weight of the waste transported to landfill or recycling (tons)	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Total number of trips	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of miles per trip	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total distance traveled (miles)	50	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.1	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	9.8E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	6.9E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	4.6E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	1.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	2.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	9.4E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	1.9E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	3.9E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	3.1E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**7.2E-02**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**2.3E-05**
Offsite SOx Emission (metric ton)	**9.4E-07**
Offsite PM_{10} Emission (metric ton)	**1.9E-06**
Accident Risk - Fatality	**3.9E-07**
Accident Risk - Injury	**3.1E-05**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**9.8E-01**
Energy Used (MWh)	**NA**

LANDFILL OPERATIONS

	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6	Operation 7	Operation 8	Operation 9	Operation 10	Operation 11	Operation 12
Landfill type	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
Waste disposed in landfill (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Landfill methane emissions (metric tons CH_4)	0	0	0	0	0	0	0	0	0	0	0	0
Waste disposed in non-hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waste disposed in hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy used (MMBTU/ton)	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01
Electricity used (MWh/ton)	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03
CO_2 e emission factor (lb/ton)	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01
NOx emission factor (lb/ton)	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01
SOx emission factor (lb/ton)	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02
PM_{10} emission factor (lb/ton)	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM LANDFILL OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

THERMAL/CATALYTIC OXIDIZERS

	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6	Oxidizer 7	Oxidizer 8	Oxidizer 9	Oxidizer 10	Oxidizer 11	Oxidizer 12
Oxidizer type	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Waste gas flow rate (scfm)	0	0	0	0	0	0	0	0	0	0	0	0
Time running (hours)	0	0	0	0	0	0	0	0	0	0	0	0
Input waste gas inlet temperature (F)	0	0	0	0	0	0	0	0	0	0	0	0
Input contaminant concentration (ppmV)	0	0	0	0	0	0	0	0	0	0	0	0
Heat capacity at inlet (BTU/scf - F)	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179
Combustion temperature (F)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Heat exchanger efficiency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heating value for fuel (BTU/scf)	983	983	983	983	983	983	983	983	983	983	983	983
Waste inlet temp after heat exchanger (F)	0	0	0	0	0	0	0	0	0	0	0	0
Waste gas heat content (BTU/scf)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Supplemental heat required (BTU/min)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total fuel consumed (scf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO_2 emission factor (lb/MMBTU)	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02
N_2O emission factor (lb/MMBTU)	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03
CH_4 emission factor (lb/MMBTU)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
Onsite NOx emission factor (lb/MMBTU)	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00
Onsite SOx emission factor (lb/MMBTU)	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04
Onsite PM_{10} emission factor (lb/MMBTU)	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
Offsite NOx emission factor (g/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
Offsite SOx emission factor (g/MMBTU)	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Offsite PM_{10} emission factor (g/MMBTU)	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM THERMAL OXIDIZERS	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	7.2E-02
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	2.3E-05
Offsite SOx Emission (metric ton)	9.4E-07

This worksheet allows the user to calculate the water used and GHG emissions from onsite activities

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WATER CONSUMPTION

	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6	Treatment System 7	Treatment System 8	Treatment System 9	Treatment System 10	Treatment System 11	Treatment System 12
Water consumed from municipal water treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Water disposed to wastewater treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Total water consumption (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption (Btu/gal) for water treatment	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00
CO_2 e emission factor (kg/gal) for water treatment	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03
NOx emission factor (g/gal) for water treatment	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03
SOx emission factor (g/gal) for water treatment	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03
PM_{10} emission factor (g/gal) for water treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
Energy consumption (Btu/gal) for wastewater treatment	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01
CO_2 e emission factor (kg/gal) for wastewater treatment	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/gal) for wastewater treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
SOx emission factor (g/gal) for wastewater treatment	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03
PM10 emission factor (g/gal) for wastewater treatment	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER CONSUMPTION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gal)	0.0E+00
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

ONSITE LAND AND WATER RESOURCE CONSUMPTION

	Entire Site 1	Entire Site 2	Entire Site 3	Entire Site 4	Entire Site 5	Entire Site 6	Entire Site 7	Entire Site 8	Entire Site 9	Entire Site 10	Entire Site 11	Entire Site 12
Volume of topsoil brought to site (cubic yards)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of groundwater or surface water lost (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOTAL FROM ONSITE LAND AND WATER RESOURCE CONSUMPTION	
Topsoil consumption (yd^3)	0.0E+00
Water loss (gal)	0.0E+00

TOTAL FROM RESOURCE CONSUMPTION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Consumption (gal)	0.0E+00
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

Environmental Footprint Summary

Activities	CO_2 Emissions	Percent Total	Onsite NOx emissions	Percent Total	Onsite SOx Emissions	Percent Total	Onsite PM_{10} Emissions	Percent Total	Total NOx emissions	Percent Total	Total SOx Emissions	Percent Total	Total PM_{10} Emissions	Percent Total	Total Energy Used	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	MMBTU	%		%		%
Material Productions	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	NA	NA	NA	NA
Transportation-Personnel	0.45	65.94	NA	-	NA	-	NA	-	1.6E-04	8.6	4.4E-06	2.1	2.1E-05	11.9	5.8E+00	66.3	6.3E-06	75.6	5.1E-04	53.3
Transportation-Equip/materials	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Equipment Use and Misc	0.16	23.63	1.5E-03	100.0	1.6E-04	100.0	1.4E-04	100.0	1.6E-03	90.1	2.0E-04	97.4	1.5E-04	87.1	2.0E+00	22.4	1.6E-06	19.7	4.1E-04	43.4
Residual Handling	0.07	10.43	0.0E+00	-	0.0E+00	-	0.0E+00	-	2.3E-05	1.3	9.4E-07	0.4	1.9E-06	1.1	9.8E-01	11.2	3.9E-07	4.7	3.1E-05	3.3
Total	0.69	100	1.55E-03	100.0	1.58E-04	100	1.39E-04	100	1.82E-03	100	2.10E-04	100	1.75E-04	100	8.72E+00	100	8.4E-06	100	9.5E-04	100

NA: Not Available or Not Applicable

Environmental Footprint Summary continued

Activities	Water Usage	Percent Total	Electrical Usage	Lost Hours - Injury	Percent Total
	gallons	%	MWH		%
Material Productions	NA	NA	NA	NA	NA
Transportation-Personnel	NA	NA	NA	4.1E-03	53.3
Transportation-Equipment	NA	NA	NA	0.0E+00	-
Equipment Use and Misc	0.00	-	0.00E+00	3.3E-03	43.4
Residual Handling	NA	NA	NA	2.5E-04	3.3
Total	0.00E+00	100	0.00E+00	7.63E-03	100.0

Footprint Reduction

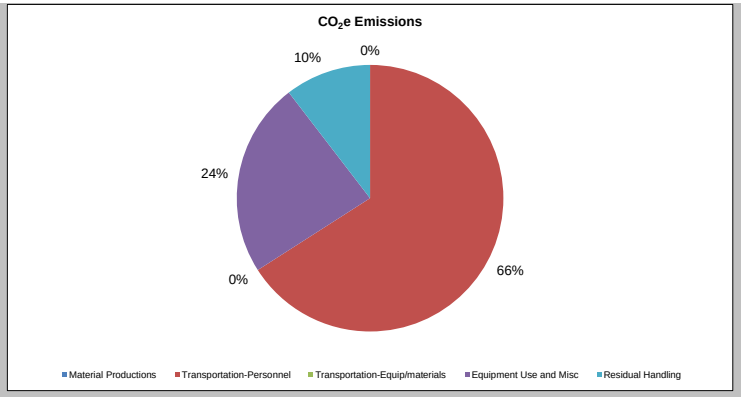
Total electricity replacement (MWh)	0.00E+00
Total electricity replacement (mmBtu)	0.00E+00
Percent electricity from renewable sources (%)	0.0%
Landfill gas reduction (metric ton CO_2 e)	0.00E+00
GHG emissions (metric ton CO2 e)	0.00E+00
NOx emissions (metric ton)	0.00E+00
SOx emissions (metric ton)	0.00E+00
PM10 emissions (metric ton)	0.00E+00
Water consumption reduction (gallons)	0.00E+00

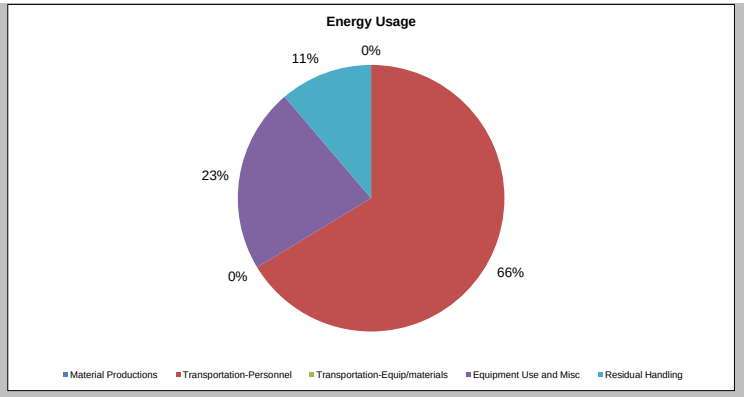
Additional Sustainability Metrics

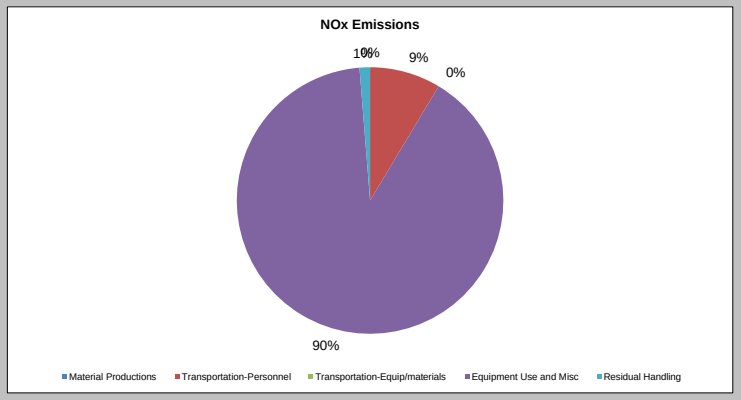
Non-Hazardous Waste Landfill Space (tons)	0.0
Hazardous Waste Landfill Space (tons)	0.0
Topsoil Consumption (yd^3)	0.0
Cost of Phase ($)	0.0
Lost Hours - Injury	0.0

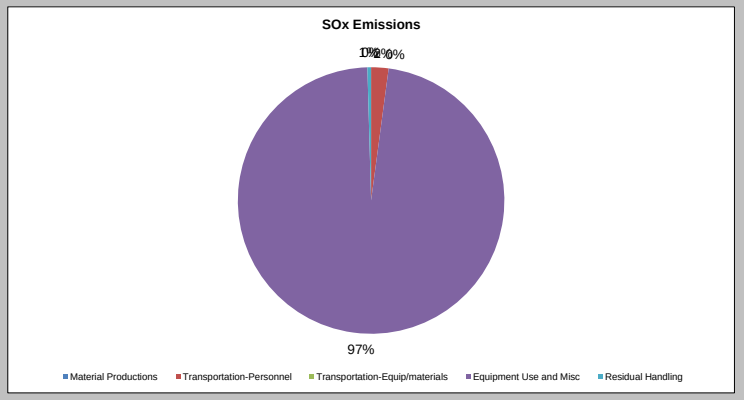
Duration of Phase

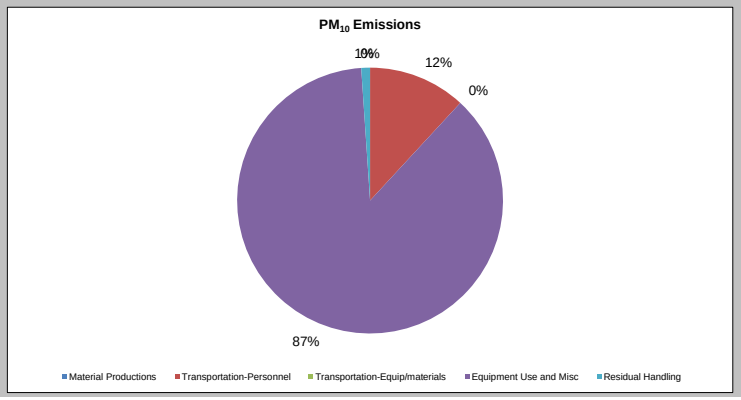
Duration (unit time)	1

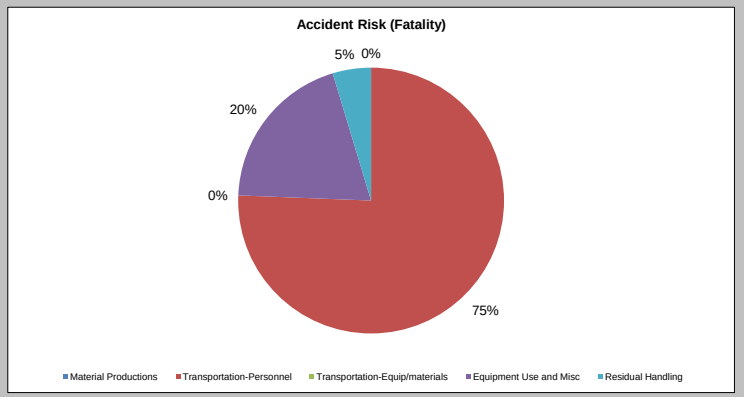

CO_2e Emissions
0%
10%
24%
0%
66%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

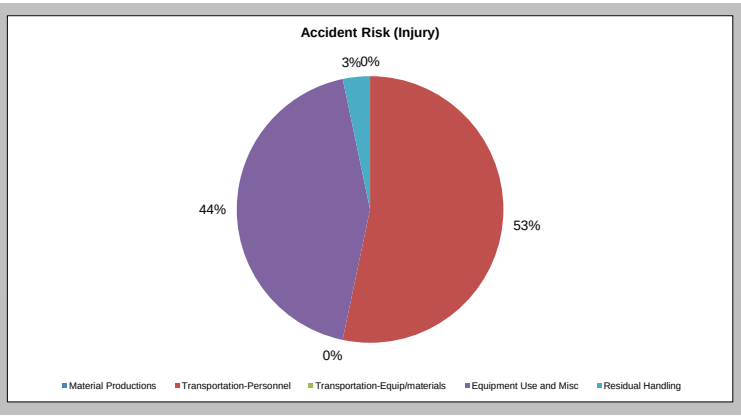

Energy Usage
0%
11%
23%
0%
66%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

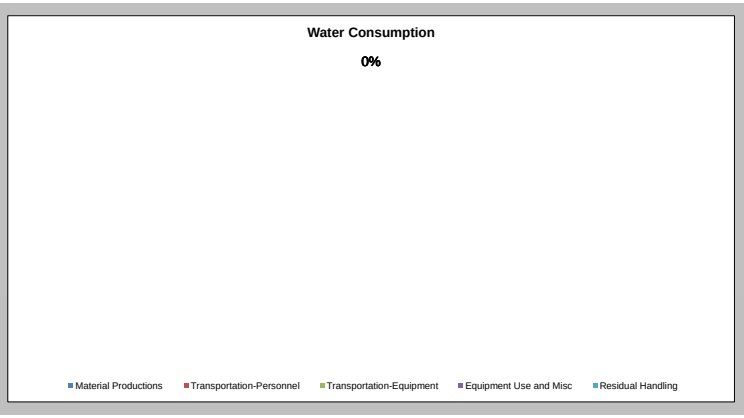

NOx Emissions
9%
0%
90%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


SOx Emissions
97%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


PM_{10} Emissions
12%
0%
87%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Fatality)
5%
0%
20%
0%
75%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Injury)
3%
0%
44%
53%
0%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Water Consumption
0%
Material Productions
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

This worksheet allows the user to calculate the life cycle environmental footprint of the materials used

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WELL MATERIALS

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Specific casing material schedule	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Well diameter from drop down menu (in)	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Total weight of Sand (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Gravel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Bentonite (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Typical Cement (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of General Concrete (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Steel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Casing material type	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Weight of casing material (lb/ft)	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02
Total length of casing material required (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00
NOx emission factor (g/kg)	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
SOx emission factor (g/kg)	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00
PM_{10} emission factor (g/kg)	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00
MJ/kg material	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT CHEMICALS & MATERIALS

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Number of injection points	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Amount of material injected at each point (lbs dry mass)	0	0	0	0	0	0	0	0	0	0	0	0
Number of injections per injection point	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of injected material (lbs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total weight of injected material (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00
NOx emission factor (g/kg)	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00
SOx emission factor (g/kg)	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00
PM_{10} emission factor (g/kg)	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00
MJ/kg material	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT CHEMICALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT MEDIA

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Weight of media used (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC
Total weight of media (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00
NOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
SOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
PM10 emission factor (g/kg)	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04
MJ/kg material	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT MEDIA PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CONSTRUCTION MATERIALS

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner
Area of material (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of material (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00
NOx emission factor (g/kg)	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00
SOx emission factor (g/kg)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
PM10 emission factor (g/kg)	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00
MJ/kg material	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM CONSTRUCTION MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**

Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

WELL DECOMMISSIONING

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Well diameter (in)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of well (ft^3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Total volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02
NOx emission factor (g/kg)	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02
SOx emission factor (g/kg)	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01
PM10 emission factor (g/kg)	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02
MJ/kg material	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DECOMMISSIONING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

SILT CURTAIN MATERIALS

	CURTAIN 1	CURTAIN 2	CURTAIN 3	CURTAIN 4	CURTAIN 5	CURTAIN 6	CURTAIN 7	CURTAIN 8	CURTAIN 9	CURTAIN 10	CURTAIN 11	CURTAIN 12
Input length or perimeter of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Input depth of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Area of material required (ft^2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/ft^2 material)	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01
NOx emission factor (g/m^3)	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01
SOx emission factor (g/ft^3)	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01
PM10 emission factor (g/ft^3)	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02
MJ/ft^2 material	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
CO_2 e emission factor (kg CO_2/linear ft material)	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00
NOx emission factor (g/linear ft)	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00
SOx emission factor (g/linear ft)	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00
PM10 emission factor (g/linear ft)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
MJ/linear ft material	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SILT CURTAIN MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

BULK MATERIAL QUANTITIES

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	Gravel	Steel	Typical Cement	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid
Units of quantity	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
Quantity	1,231,034	29,640	2,295	0	0	0	0	0	0	0	0	0
Density of material (kg/m^3)	1682.0	7860.0	1506.0	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6
Total weight of material required (kg)	558387.9	13444.4	1041.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.70E-02	1.77E+00	8.30E-01	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
NOx emission factor (g/kg)	6.80E-02	5.31E+00	1.66E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00
SOx emission factor (g/kg)	8.50E-02	8.85E+00	3.32E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00
PM10 emission factor (g/kg)	3.40E-02	1.77E+00	6.64E-01	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
MJ/kg material	0.3	24.4	4.6	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
ENERGY OUTPUT												
Energy used (BTU)	1.6E+08	3.1E+08	4.5E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	9.5E+00	2.4E+01	8.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	3.8E-02	7.1E-02	1.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	4.7E-02	1.2E-01	3.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	1.9E-02	2.4E-02	6.9E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BULK MATERIALS	
CO_2 e Emission (metric ton)	**3.4E+01**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**1.1E-01**
Offsite SOx Emission (metric ton)	**1.7E-01**
Offsite PM_{10} Emission (metric ton)	**4.3E-02**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**4.7E+08**
Energy Used (MWh)	**NA**

TOTAL FROM MATERIAL PRODUCTION	
CO_2 e Emission (metric ton)	**3.4E+01**
Onsite NOx Emission (metric ton)	**NA**

This worksheet allows the user to calculate the environmental footprint of personnel travel	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

TRANSPORTATION - ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle type	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Distance traveled per trip (miles)	60	0	130	0	0	0	0	0	0	0	0	0
Number of trips taken	114	0	13	0	0	0	0	0	0	0	0	0
Number of travelers	1	0	1	0	0	0	0	0	0	0	0	0
Total distance traveled (miles)	6840	0	1690	0	0	0	0	0	0	0	0	0
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Consumption rate (MPG)	29	29	29	29	29	29	29	29	29	29	29	29
Estimated MPG (input the default if not known)	0	0	0	0	0	0	0	0	0	0	0	0
Total fuel used (gallons)	235.9	0.0	58.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/mile)	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02
N_2O emission factor (g/mile)	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02
CH_4 emission factor (g/mile)	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01
NOx emission factor (g/mile)	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01
SOx emission factor (g/mile)	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03
PM_{10} emission factor (g/mile)	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02
ENERGY OUTPUT												
Energy used (BTU)	3.3E+07	0.0E+00	8.1E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	2.5E+00	0.0E+00	6.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	3.5E-02	0.0E+00	8.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	6.4E-02	0.0E+00	1.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	9.6E-04	0.0E+00	2.4E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	3.4E-05	0.0E+00	8.4E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	2.0E-04	0.0E+00	4.8E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	5.3E-05	0.0E+00	1.3E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	4.3E-03	0.0E+00	1.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**3.3E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**1.2E-03**
Offsite SOx Emission (metric ton)	**4.2E-05**
Offsite PM_{10} Emission (metric ton)	**2.4E-04**
Accident Risk - Fatality	**6.7E-05**
Accident Risk - Injury	**5.4E-03**
Water Used (gallons)	**NA**
Energy Used (BTU)	**4.1E+07**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Number of flights taken	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843
CO_2 emission factor (kg/passenger mile)	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01
N_2O emission factor (g/passenger mile)	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03
CH_4 emission factor (g/passenger mile)	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02
NOx emission factor (g/passenger mile)	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01
SO_2 emission factor (g/passenger mile)	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02
PM_{10} emission factor (g/passenger mile)	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Type of rail used	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of trips taken	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
CO_2 emission factor (kg/passenger mile)	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01
N_2O emission factor (g/passenger mile)	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
CH_4 emission factor (g/passenger mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/passenger mile)	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02
SOx emission factor (g/passenger mile)	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01
PM_{10} emission factor (g/passenger mile)	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**

Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (BTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM PERSONNEL TRANSPORTATION	
CO_2 e Emission (metric ton)	3.3E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	1.2E-03
Offsite SOx Emission (metric ton)	4.2E-05

This worksheet allows the user to calculate the environmental footprint of equipment and material transport	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EQUIPMENT TRANSPORTATION - DEDICATED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Account for an empty return trip?	No	No	No	No	No	No	No	No	No	No	No	No
Distance travelled (mi)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DEDICATED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

EQUIPMENT TRANSPORTATION - SHARED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency (ton-mpg)	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SHARED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
CO_2 emission factor (kg/ton mile)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
N_2O emission factor (g/ton mile)	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02
CH_4 emission factor (g/ton mile)	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02
NOx emission factor (g/ton mile)	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00
SOx emission factor (g/ton mile)	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01
PM_{10} emission factor (g/ton mile)	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**

Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02
CO_2 emission factor (kg/ton mile)	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02
N_2O emission factor (g/ton mile)	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04
CH_4 emission factor (g/ton mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/ton mile)	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01
SOx emission factor (g/ton mile)	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01
PM_{10} emission factor (g/ton mile)	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - WATER

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02
CO_2 emission factor (kg/ton mile)	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02
N_2O emission factor (g/ton mile)	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03
CH_4 emission factor (g/ton mile)	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04
NOx emission factor (g/ton mile)	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00
SOx emission factor (g/ton mile)	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01
PM_{10} emission factor (g/ton mile)	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM EQUIPMENT TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EARTHWORK EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Excavator	Excavator	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	3,265	3,265	250	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
Approximate net power (hp)	125	125	65	65	65	65	65	65	65	65	65	65
Production rate (yd^3/hr)	170	170	100	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	8	8	5	5	5	5	5	5	5	5	5	5
Equipment operating hours (hr)	28.1	28.1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	221.9	221.9	25.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	5.83E+04	5.83E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.74E+00	1.74E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	3.95E+00	3.95E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	3.40E+02	3.40E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	8.80E+01	8.80E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	3.20E+01	3.20E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	4.9E+01	4.9E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	2.5E+01	2.5E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	7.3E+00	7.3E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	3.0E+07	3.0E+07	3.5E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	1.6E+00	1.6E+00	1.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	1.5E-02	1.5E-02	1.7E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	2.3E-03	2.3E-03	2.7E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	1.4E-03	1.4E-03	1.6E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	7.1E-04	7.1E-04	8.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	2.0E-04	2.0E-04	2.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	9.5E-03	9.5E-03	8.3E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	2.5E-03	2.5E-03	2.1E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	2.7E-04	2.7E-04	3.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	2.6E-06	2.6E-06	4.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	6.5E-04	6.5E-04	1.2E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BACKHOE, DOZER, AND SCRAPER OPERATION	
CO_2 e Emission (metric ton)	**3.5E+00**
Onsite NOx Emission (metric ton)	**2.0E-02**
Onsite SOx Emission (metric ton)	**5.1E-03**
Onsite PM_{10} Emission (metric ton)	**5.7E-04**
Offsite NOx Emission (metric ton)	**2.9E-03**
Offsite SOx Emission (metric ton)	**1.5E-03**
Offsite PM_{10} Emission (metric ton)	**4.3E-04**
Accident Risk - Fatality	**5.6E-06**
Accident Risk - Injury	**1.4E-03**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**6.4E+01**
Energy Used (MWh)	**NA**

WELL DRILLING EQUIPMENT

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12
Number of injection and extraction points/wells	0	0	0	0	0	0	0	0	0	0	0	0
Drilling method	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push
Drilling fuel consumption rate (gal/hr)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Time spent drilling each injection site (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Total time drilling well (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total fuel consumption during drilling (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (kg/gallon)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
N_2O emission factor (g/gal)	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01
CH_4 emission factor (g/gal)	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01
NOx emission factor (g/gal)	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02
SOx emission factor (g/gal)	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01
PM_{10} emission factor (g/gal)	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01
Offsite NOx emission factor (g/hr)	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00
Offsite SOx emission factor (g/hr)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
Offsite PM_{10} emission factor (g/hr)	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission from drilling (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	ACCIDENT RISK												
	Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DRILLING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRENCHING EQUIPMENT

	Trencher 1	**Trencher 2**	**Trencher 3**	**Trencher 4**	**Trencher 5**	**Trencher 6**	**Trencher 7**	**Trencher 8**	**Trencher 9**	**Trencher 10**	**Trencher 11**	**Trencher 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Equipment operating hours	0	0	0	0	0	0	0	0	0	0	0	0

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

SEDIMENT MANAGEMENT (STAGING AND DRYING)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Is volume input that of saturated sediment?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Will the sediment be dry when this work is performed?	No	No	No	No	No	No	No	No	No	No	No	No
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
Actual volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Approximate net power (hp)	175	175	175	175	175	175	175	175	175	175	175	175
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05
N_2O emission factor (g/hr)	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00
CH_4 emission factor (g/hr)	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00
Onsite NOx emission factor (g/hr)	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02
Onsite SOx emission factor (g/hr)	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02
Onsite PM_{10} emission factor (g/hr)	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01
Offsite NOx emission factor (g/hr)	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01
Offsite SOx emission factor (g/hr)	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01
Offsite PM_{10} emission factor (g/hr)	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SEDIMENT MANAGEMENT (STAGING AND DRYING)	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

This worksheet allows the user to calculate the environmental footprint of operating pumps on site

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

ELECTRIC PUMP OPERATION - For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pumps or unused methods

		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Method 1 - IF ELECTRICAL USAGE IS KNOWN													
	Pump electrical usage (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
Method 2 - IF PUMP HEAD IS KNOWN													
	Flow rate (gpm)	0	0	0	0	0	0	0	0	0	0	0	0
	Total head (ft)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Pump efficiency	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump times motor efficiency	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Specific gravity	1	1	1	1	1	1	1	1	1	1	1	1
	Pump horsepower (hp)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Method 3 - IF NAME PLATE SPECIFICATIONS ARE KNOWN													
	Pump horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Pump load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
SELECT REGION													
	Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
	CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
	N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
	CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
	NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
	SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
	PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
	Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
	ENERGY OUTPUT												
	Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx and SOx OUTPUT												
	NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRIC PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

DIESEL AND GASOLINE PUMPS

	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
Equipment operating hours (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02
N_2O emission factor (g/hr)	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02
CH_4 emission factor (g/hr)	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02
Onsite NOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00
Offsite NOx emission factor (g/hr)	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01

	Offsite SOx emission factor (g/hr)	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01
	Offsite PM_{10} emission factor (g/hr)	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02
	ENERGY OUTPUT												
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL AND GASOLINE PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM PUMP OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of using electrical equipment

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

Equipment Operation - For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Type of equipment	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower
Method 1 - IF NAME PLATE SPECIFICATIONS ARE KNOWN												
Equipment horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
Number of equipments operating	0	0	0	0	0	0	0	0	0	0	0	0
Operating time for each equipment (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Equipment load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - IF ELECTRICAL USAGE IS KNOWN												
Equipment electrical usage, if known (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
SELECT REGION												
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx and SOx OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRICAL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

GENERATORS

	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6	Generator 7	Generator 8	Generator 9	Generator 10	Generator 11	Generator 12
Fuel type	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	75 to 100	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Operating hours (hr)	2178	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	2.15E+00	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02
Fuel used (gal)	4688.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	2.7E+04	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02
N_2O emission factor (g/hr)	6.3E-01	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02
CH_4 emission factor (g/hr)	3.3E+01	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NOx emission factor (g/hr)	2.4E+02	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00
SOx emission factor (g/hr)	3.7E+01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01
PM_{10} emission factor (g/hr)	2.8E+01	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Offsite NOx emission factor (g/hr)	1.3E+01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01
Offsite SOx emission factor (g/hr)	6.9E+00	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
Offsite PM_{10} emission factor (g/hr)	2.0E+00	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02
ENERGY OUTPUT												
Energy used (BTU)	6.4E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	5.8E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	4.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	1.5E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	2.9E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	1.5E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Offsite PM_{10} emission (metric ton)	4.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	5.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	6.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	5.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM GENERATOR OPERATION	
CO_2 e Emission (metric ton)	6.0E+01
Onsite NOx Emission (metric ton)	5.0E-01
Onsite SOx Emission (metric ton)	6.7E-02
Onsite PM_{10} Emission (metric ton)	5.6E-02
Offsite NOx Emission (metric ton)	2.9E-02
Offsite SOx Emission (metric ton)	1.5E-02
Offsite PM_{10} Emission (metric ton)	4.3E-03
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	6.4E+02
Energy Used (MWh)	NA

TOTAL FROM ELECTRICAL EQUIPMENT OPERATIONS	
CO_2 e Emission (metric ton)	6.0E+01
Onsite NOx Emission (metric ton)	5.0E-01
Onsite SOx Emission (metric ton)	6.7E-02
Onsite PM_{10} Emission (metric ton)	5.6E-02

This worksheet allows the user to calculate the environmental footprint of equipment use	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

AGRICULTURAL EQUIPMENT

	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6	Tillage Tractor 7	Tillage Tractor 8	Tillage Tractor 9	Tillage Tractor 10	Tillage Tractor 11	Tillage Tractor 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area to till (acre)	0	0	0	0	0	0	0	0	0	0	0	0
Soil condition	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil
Soil type	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of tillage (in)	0	0	0	0	0	0	0	0	0	0	0	0
Tractor horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tractor horsepower used	16	16	16	16	16	16	16	16	16	16	16	16
Consumption rate (gal/hr)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Actual equipment operating hours (hr), limited by tractor horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03
N_2O emission factor (g/hr)	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01
CH_4 emission factor (g/hr)	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00
NOx emission factor (g/hr)	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01
SOx emission factor (g/hr)	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00
PM_{10} emission factor (g/hr)	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00
Offsite NOx emission factor (g/hr)	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00
Offsite SOx emission factor (g/hr)	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00
Offsite PM_{10} emission factor (g/hr)	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TRACTOR AND TILLER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CAPPING EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Equipment type	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Calculated area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Actual equipment operating hours (hr), limited by machine horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower used	11	11	11	11	11	11	11	11	11	11	11	11
Consumption Rate (gal/hr)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03
N_2O emission factor (g/hr)	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01
CH_4 emission factor (g/hr)	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01
Onsite NOx emission factor (g/hr)	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01
Onsite SOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Offsite NOx emission factor (g/hr)	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00

Offsite SOx emission factor (g/hr)	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00
Offsite PM_{10} emission factor (g/hr)	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROLLER AND PAVER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

MIXING EQUIPMENT

	Mixer 1	**Mixer 2**	**Mixer 3**	**Mixer 4**	**Mixer 5**	**Mixer 6**	**Mixer 7**	**Mixer 8**	**Mixer 9**	**Mixer 10**	**Mixer 11**	**Mixer 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Volume (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
N_2O emission factor (g/hr)	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02
CH_4 emission factor (g/hr)	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01
Onsite NOx emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite NOx emission factor (g/hr)	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00
Offsite SOx emission factor (g/hr)	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01
Offsite PM_{10} emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM MIXER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**

Energy Used (MWh)	**NA**

INTERNAL COMBUSTION ENGINES

	Engine 1	Engine 2	Engine 3	Engine 4	Engine 5	Engine 6	Engine 7	Engine 8	Engine 9	Engine 10	Engine 11	Engine 12
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Estimated fuel consumption rate (gal or scf/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel used (gal or scf)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon or scf fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal or scf)	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04
N_2O emission factor (g/gal or scf)	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01
CH_4 emission factor (g/gal or scf)	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01
Onsite NOx emission factor (g/gal or scf)	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01
Onsite SOx emission factor (g/gal or scf)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/gal or scf)	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00
Offsite NOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM INTERNAL COMBUSTION ENGINE OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OTHER FUELED EQUIPMENT

	Fuel 1	Fuel 2	Fuel 3	Fuel 4	Fuel 5	Fuel 6	Fuel 7	Fuel 8	Fuel 9	Fuel 10	Fuel 11	Fuel 12
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Volume (scf for Natural gas, gallons for all others)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon or scf	983	983	983	983	983	983	983	983	983	983	983	983
CO2 emission factor (lb/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
N2O emission factor (lb/MMBTU)	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03
CH4 emission factor (lb/MMBTU)	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00
NOx emission factor (lb/MMBTU)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
SOx emission factor (lb/MMBTU)	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04
PM10 emission factor (lb/MMBTU)	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02
Offsite NOx emission factor (g/gal or scf)	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01
Offsite SOx emission factor (g/gal or scf)	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02
Offsite PM_{10} emission factor (g/gal or scf)	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OTHER FUELED EQUIPMENT	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

DIESEL EQUIPMENT (PER HOUR BASIS)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Choose equipment type from drop down menu	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Choose equipment size for Dozer (HP)	65	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1
Choose equipment size for Loader (HP)	65	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Choose equipment size for Excavator (HP)	150	150	150	150	150	150	150	150	150	150	150	150
Choose equipment size for Scraper (HP)	330	330	330	330	330	330	330	330	330	330	330	330
Choose equipment size for Crawler Crane	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1
Choose equipment size for Tillage Tractor (HP)	16	16	16	16	16	16	16	16	16	16	16	16
Choose equipment size for Paver (HP)	25	25	25	25	25	25	25	25	25	25	25	25
Choose equipment size for Roller (HP)	6	6	6	6	6	6	6	6	6	6	6	6
Choose equipment size for Trencher (HP range)	6 to 11	7 to 11	8 to 11	9 to 11	10 to 11	11 to 11	12 to 11	13 to 11	14 to 11	15 to 11	16 to 11	17 to 11
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate equipment size for earthwork equipment	65	65	65	65	65	65	65	65	65	65	65	65
Approximate equipment size for other equipment	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Corrected Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OPERATOR LABOR

	Occupation 1	Occupation 2	Occupation 3	Occupation 4	Occupation 5	Occupation 6	Occupation 7	Occupation 8	Occupation 9	Occupation 10	Occupation 11	Occupation 12
Occupation	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers
Total time worked onsite (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fatality risk per labor hour	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08
Injury risk per labor hour	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OPERATOR LABOR	
CO_2 e Emission (metric ton)	**NA**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	NA
Offsite SOx Emission (metric ton)	NA
Offsite PM_{10} Emission (metric ton)	NA
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (MMBTU)	NA
Energy Used (MWh)	NA

LABORATORY ANALYSIS

	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Analysis 5	Analysis 6	Analysis 7	Analysis 8	Analysis 9	Analysis 10	Analysis 11	Analysis 12
Dollars spent on laboratory analysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy used (MMBTU/$)	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03
CO2 e emission factor (lb/$)	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
NOx emission factor (lb/$)	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03

This worksheet allows the user to calculate the environmental footprint of residual handling

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

RESIDUE DISPOSAL/RECYCLING

	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No
Weight of the waste transported to landfill or recycling (tons)	20.0	30.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used	Diesel	Diesel	Gasoline	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Total number of trips	220.4	15.0	0.0	24.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of miles per trip	50.0	50.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total distance traveled (miles)	11019.375	750	0	2448.75	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	5.4	4.3	7.4	5.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	2058.9	173.3	0.0	457.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	139,015	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	9.84E+03	1.01E+04	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	2.09E-01	1.14E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.18E+01	1.14E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	1.33E-01	5.79E-02	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.65E-01	2.91E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	2.8E+08	2.4E+07	0.0E+00	6.2E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	2.1E+01	1.8E+00	0.0E+00	4.6E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	7.3E-02	6.1E-03	0.0E+00	1.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	4.9E-01	4.2E-02	0.0E+00	1.1E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	6.7E-03	5.7E-04	0.0E+00	1.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	1.2E-04	1.0E-05	0.0E+00	2.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	1.8E-04	1.5E-05	0.0E+00	4.0E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	8.6E-05	5.9E-06	0.0E+00	1.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	6.9E-03	4.7E-04	0.0E+00	1.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**2.8E+01**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**8.8E-03**
Offsite SOx Emission (metric ton)	**1.6E-04**
Offsite PM_{10} Emission (metric ton)	**2.3E-04**
Accident Risk - Fatality	**1.1E-04**
Accident Risk - Injury	**8.9E-03**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**3.7E+02**
Energy Used (MWh)	**NA**

LANDFILL OPERATIONS

	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6	Operation 7	Operation 8	Operation 9	Operation 10	Operation 11	Operation 12
Landfill type	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
Waste disposed in landfill (tons)	244.875	0	0	0	0	0	0	0	0	0	0	0
Landfill methane emissions (metric tons CH_4)	0	0	0	0	0	0	0	0	0	0	0	0
Waste disposed in non-hazardous landfill (tons)	244.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waste disposed in hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy used (MMBTU/ton)	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01
Electricity used (MWh/ton)	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03
CO_2 e emission factor (lb/ton)	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01
NOx emission factor (lb/ton)	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01
SOx emission factor (lb/ton)	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02
PM_{10} emission factor (lb/ton)	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (BTU)	5.3E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	2.8E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	1.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	8.3E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	4.4E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM LANDFILL OPERATIONS	
CO_2 e Emission (metric ton)	**2.8E+00**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	1.6E-02
Offsite SOx Emission (metric ton)	8.3E-03
Offsite PM_{10} Emission (metric ton)	4.4E-02
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	5.3E+01
Energy Used (MWh)	NA

THERMAL/CATALYTIC OXIDIZERS

	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6	Oxidizer 7	Oxidizer 8	Oxidizer 9	Oxidizer 10	Oxidizer 11	Oxidizer 12
Oxidizer type	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Waste gas flow rate (scfm)	0	0	0	0	0	0	0	0	0	0	0	0
Time running (hours)	0	0	0	0	0	0	0	0	0	0	0	0
Input waste gas inlet temperature (F)	0	0	0	0	0	0	0	0	0	0	0	0
Input contaminant concentration (ppmV)	0	0	0	0	0	0	0	0	0	0	0	0
Heat capacity at inlet (BTU/scf - F)	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179
Combustion temperature (F)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Heat exchanger efficiency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heating value for fuel (BTU/scf)	983	983	983	983	983	983	983	983	983	983	983	983
Waste inlet temp after heat exchanger (F)	0	0	0	0	0	0	0	0	0	0	0	0
Waste gas heat content (BTU/scf)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Supplemental heat required (BTU/min)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total fuel consumed (scf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO_2 emission factor (lb/MMBTU)	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02
N_2O emission factor (lb/MMBTU)	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03
CH_4 emission factor (lb/MMBTU)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
Onsite NOx emission factor (lb/MMBTU)	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00
Onsite SOx emission factor (lb/MMBTU)	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04
Onsite PM_{10} emission factor (lb/MMBTU)	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
Offsite NOx emission factor (g/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
Offsite SOx emission factor (g/MMBTU)	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Offsite PM_{10} emission factor (g/MMBTU)	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM THERMAL OXIDIZERS	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	3.1E+01
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	2.4E-02
Offsite SOx Emission (metric ton)	8.5E-03

This worksheet allows the user to calculate the water used and GHG emissions from onsite activities

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WATER CONSUMPTION

	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6	Treatment System 7	Treatment System 8	Treatment System 9	Treatment System 10	Treatment System 11	Treatment System 12
Water consumed from municipal water treatment facility (gal)	13200	0	0	0	0	0	0	0	0	0	0	0
Water disposed to wastewater treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Total water consumption (gal)	13200	0	0	0	0	0	0	0	0	0	0	0
Energy consumption (Btu/gal) for water treatment	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00
CO_2 e emission factor (kg/gal) for water treatment	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03
NOx emission factor (g/gal) for water treatment	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03
SOx emission factor (g/gal) for water treatment	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03
PM_{10} emission factor (g/gal) for water treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
Energy consumption (Btu/gal) for wastewater treatment	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01
CO_2 e emission factor (kg/gal) for wastewater treatment	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/gal) for wastewater treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
SOx emission factor (g/gal) for wastewater treatment	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03
PM10 emission factor (g/gal) for wastewater treatment	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04
ENERGY OUTPUT												
Energy used (BTU)	1.2E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	3.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	5.8E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	3.5E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	9.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER CONSUMPTION	
CO_2 e Emission (metric ton)	**3.0E-02**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**5.8E-05**
Offsite SOx Emission (metric ton)	**3.5E-05**
Offsite PM_{10} Emission (metric ton)	**9.6E-05**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gal)	**1.3E+04**
Energy Used (MMBTU)	**1.2E-01**
Energy Used (MWh)	**NA**

ONSITE LAND AND WATER RESOURCE CONSUMPTION

	Entire Site 1	Entire Site 2	Entire Site 3	Entire Site 4	Entire Site 5	Entire Site 6	Entire Site 7	Entire Site 8	Entire Site 9	Entire Site 10	Entire Site 11	Entire Site 12
Volume of topsoil brought to site (cubic yards)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of groundwater or surface water lost (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOTAL FROM ONSITE LAND AND WATER RESOURCE CONSUMPTION	
Topsoil consumption (yd^3)	**0.0E+00**
Water loss (gal)	**0.0E+00**

TOTAL FROM RESOURCE CONSUMPTION	
CO_2 e Emission (metric ton)	**3.0E-02**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**5.8E-05**
Offsite SOx Emission (metric ton)	**3.5E-05**
Offsite PM_{10} Emission (metric ton)	**9.6E-05**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Consumption (gal)	**1.3E+04**
Energy Used (MMBTU)	**1.2E-01**
Energy Used (MWh)	**NA**

Environmental Footprint Summary

Activities	CO_2 Emissions	Percent Total	Onsite NOx emissions	Percent Total	Onsite SOx Emissions	Percent Total	Onsite PM_{10} Emissions	Percent Total	Total NOx emissions	Percent Total	Total SOx Emissions	Percent Total	Total PM_{10} Emissions	Percent Total	Total Energy Used	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	MMBTU	%		%		%
Material Productions	34.15	25.96	NA	-	NA	-	NA	-	1.1E-01	16.2	1.7E-01	63.7	4.3E-02	29.0	4.7E+02	29.02	NA	NA	NA	NA
Transportation-Personnel	3.25	2.47	NA	-	NA	-	NA	-	1.2E-03	0.2	4.2E-05	0.0	2.4E-04	0.2	4.1E+01	2.5	6.7E-05	36.4	5.4E-03	34.1
Transportation-Equip/materials	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Equipment Use and Misc	63.39	48.18	5.2E-01	100.0	7.2E-02	100.0	5.7E-02	100.0	5.5E-01	80.1	8.8E-02	33.1	6.2E-02	41.1	7.0E+02	42.9	5.6E-06	3.1	1.4E-03	9.0
Residual Handling	30.77	23.39	0.0E+00	-	0.0E+00	-	0.0E+00	-	2.4E-02	3.5	8.5E-03	3.2	4.5E-02	29.8	4.2E+02	25.6	1.1E-04	60.6	8.9E-03	56.9
Total	131.57	100	5.18E-01	100.0	7.18E-02	100	5.68E-02	100	6.87E-01	100	2.67E-01	100	1.50E-01	100	1.63E+03	100	1.8E-04	100	1.6E-02	100

NA: Not Available or Not Applicable

Environmental Footprint Summary continued

Activities	Water Usage	Percent Total	Electrical Usage	Lost Hours - Injury	Percent Total
	gallons	%	MWH		%
Material Productions	NA	NA	NA	NA	NA
Transportation-Personnel	NA	NA	NA	4.3E-02	34.1
Transportation-Equipment	NA	NA	NA	0.0E+00	-
Equipment Use and Misc	13200.00	100.00	0.00E+00	1.1E-02	9.0
Residual Handling	NA	NA	NA	7.1E-02	56.9
Total	1.32E+04	100	0.00E+00	1.26E-01	100.0

Footprint Reduction

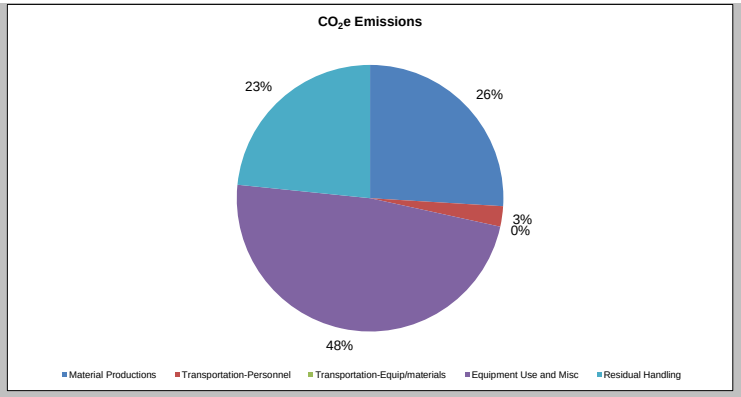
Total electricity replacement (MWh)	0.00E+00
Total electricity replacement (mmBtu)	0.00E+00
Percent electricity from renewable sources (%)	0.0%
Landfill gas reduction (metric ton CO_2 e)	0.00E+00
GHG emissions (metric ton CO2 e)	0.00E+00
NOx emissions (metric ton)	0.00E+00
SOx emissions (metric ton)	0.00E+00
PM10 emissions (metric ton)	0.00E+00
Water consumption reduction (gallons)	0.00E+00

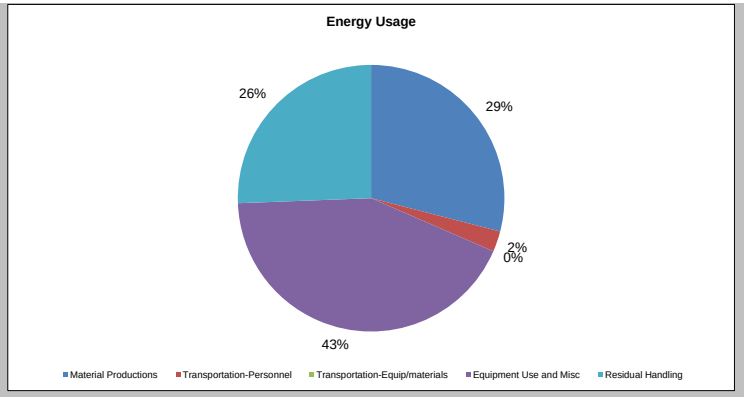
Additional Sustainability Metrics

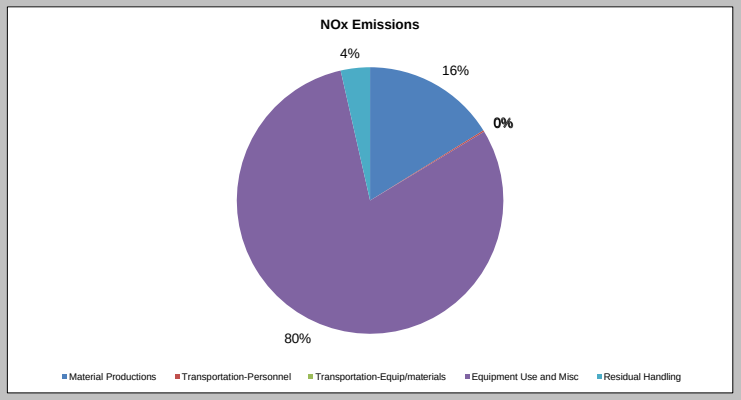
Non-Hazardous Waste Landfill Space (tons)	244.9
Hazardous Waste Landfill Space (tons)	0.0
Topsoil Consumption (yd^3)	0.0
Cost of Phase ($)	0.0
Lost Hours - Injury	0.1

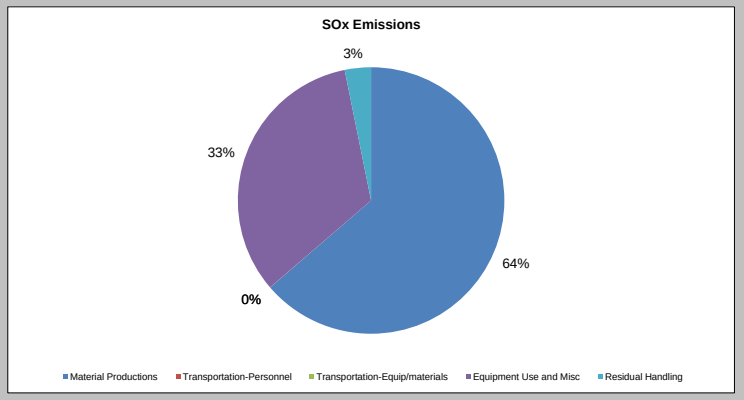
Duration of Phase

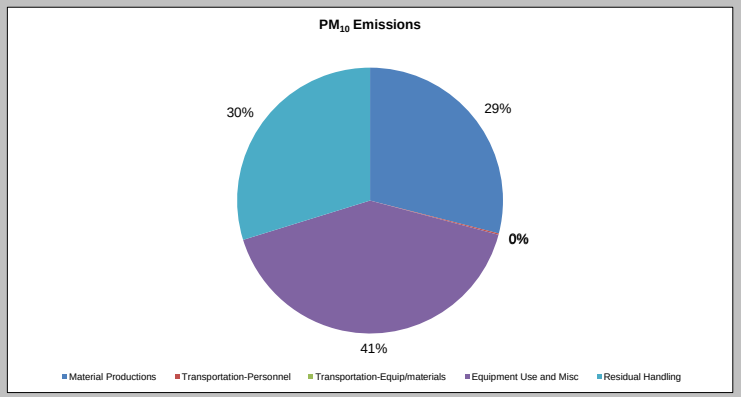
Duration (unit time)	1

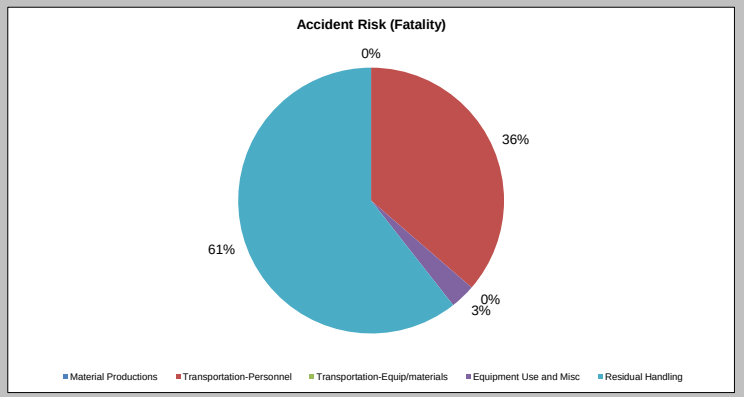

CO_2e Emissions
23%
26%
3%
0%
48%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

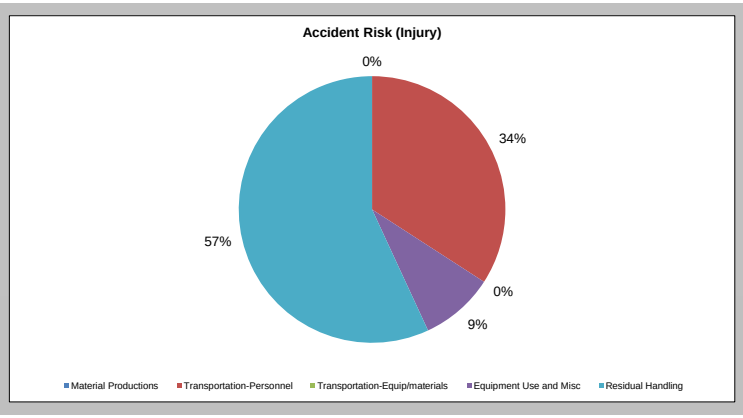

Energy Usage
26%
29%
2%
0%
43%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

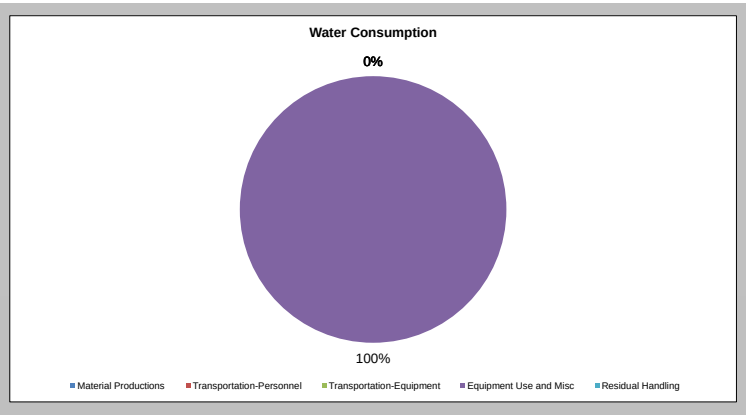

NOx Emissions
4%
16%
0%
80%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


SOx Emissions
3%
33%
64%
0%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


PM_{10} Emissions
30%
29%
0%
41%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Fatality)
0%
36%
61%
0%
3%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Injury)
0%
34%
57%
0%
9%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Water Consumption
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

This worksheet allows the user to calculate the life cycle environmental footprint of the materials used

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WELL MATERIALS

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Specific casing material schedule	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Well diameter from drop down menu (in)	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Total weight of Sand (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Gravel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Bentonite (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Typical Cement (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of General Concrete (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Steel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Casing material type	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Weight of casing material (lb/ft)	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02
Total length of casing material required (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00
NOx emission factor (g/kg)	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
SOx emission factor (g/kg)	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00
PM_{10} emission factor (g/kg)	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00
MJ/kg material	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT CHEMICALS & MATERIALS

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Number of injection points	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Amount of material injected at each point (lbs dry mass)	0	0	0	0	0	0	0	0	0	0	0	0
Number of injections per injection point	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of injected material (lbs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total weight of injected material (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00
NOx emission factor (g/kg)	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00
SOx emission factor (g/kg)	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00
PM_{10} emission factor (g/kg)	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00
MJ/kg material	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT CHEMICALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT MEDIA

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Weight of media used (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC
Total weight of media (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00
NOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
SOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
PM10 emission factor (g/kg)	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04
MJ/kg material	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT MEDIA PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CONSTRUCTION MATERIALS

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	General Concrete	Gravel	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner
Area of material (ft^2)	1800	1800	0	0	0	0	0	0	0	0	0	0
Depth of material (ft)	0.5	0.5	0	0	0	0	0	0	0	0	0	0
Volume of material required (ft^3)	900.0	900.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	2371.0	1682.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0
Total weight of material required (kg)	60425.3	42866.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.30E-01	1.70E-02	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00
NOx emission factor (g/kg)	2.60E-01	6.80E-02	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00
SOx emission factor (g/kg)	5.20E-01	8.50E-02	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
PM10 emission factor (g/kg)	1.04E-01	3.40E-02	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00
MJ/kg material	1.0	0.3	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9
ENERGY OUTPUT												
Energy used (BTU)	5.4E+07	1.2E+07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	7.9E+00	7.3E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	1.6E-02	2.9E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	3.1E-02	3.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	6.3E-03	1.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM CONSTRUCTION MATERIALS	
CO_2 e Emission (metric ton)	**8.6E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**1.9E-02**
Offsite SOx Emission (metric ton)	**3.5E-02**
Offsite PM_{10} Emission (metric ton)	**7.7E-03**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**

Water Used (gallons)	**NA**
Energy Used (BTU)	**6.7E+07**
Energy Used (MWh)	**NA**

WELL DECOMMISSIONING

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Well diameter (in)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of well (ft^3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Total volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02
NOx emission factor (g/kg)	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02
SOx emission factor (g/kg)	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01
PM10 emission factor (g/kg)	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02
MJ/kg material	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DECOMMISSIONING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

SILT CURTAIN MATERIALS

	CURTAIN 1	CURTAIN 2	CURTAIN 3	CURTAIN 4	CURTAIN 5	CURTAIN 6	CURTAIN 7	CURTAIN 8	CURTAIN 9	CURTAIN 10	CURTAIN 11	CURTAIN 12
Input length or perimeter of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Input depth of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Area of material required (ft^2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/ft^2 material)	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01
NOx emission factor (g/ft^3)	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01
SOx emission factor (g/ft^3)	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01
PM10 emission factor (g/ft^3)	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02
MJ/ft^2 material	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
CO_2 e emission factor (kg CO_2/linear ft material)	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00
NOx emission factor (g/linear ft)	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00
SOx emission factor (g/linear ft)	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00
PM10 emission factor (g/linear ft)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
MJ/linear ft material	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SILT CURTAIN MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

BULK MATERIAL QUANTITIES

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	Gravel	Steel	Typical Cement	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid
Units of quantity	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
Quantity	0	0	0	0	0	0	0	0	0	0	0	0
Density of material (kg/m^3)	1682.0	7860.0	1506.0	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.70E-02	1.77E+00	8.30E-01	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
NOx emission factor (g/kg)	6.80E-02	5.31E+00	1.66E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00
SOx emission factor (g/kg)	8.50E-02	8.85E+00	3.32E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00
PM10 emission factor (g/kg)	3.40E-02	1.77E+00	6.64E-01	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
MJ/kg material	0.3	24.4	4.6	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BULK MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM MATERIAL PRODUCTION	
CO_2 e Emission (metric ton)	**8.6E+00**
Onsite NOx Emission (metric ton)	**NA**

This worksheet allows the user to calculate the environmental footprint of personnel travel	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

TRANSPORTATION - ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle type	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Distance traveled per trip (miles)	60	0	130	0	0	0	0	0	0	0	0	0
Number of trips taken	22	0	10	0	0	0	0	0	0	0	0	0
Number of travelers	1	0	1	0	0	0	0	0	0	0	0	0
Total distance traveled (miles)	1320	0	1300	0	0	0	0	0	0	0	0	0
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Consumption rate (MPG)	29	29	29	29	29	29	29	29	29	29	29	29
Estimated MPG (input the default if not known)	0	0	0	0	0	0	0	0	0	0	0	0
Total fuel used (gallons)	45.5	0.0	44.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/mile)	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02
N_2O emission factor (g/mile)	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02
CH_4 emission factor (g/mile)	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01
NOx emission factor (g/mile)	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01
SOx emission factor (g/mile)	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03
PM_{10} emission factor (g/mile)	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02
ENERGY OUTPUT												
Energy used (BTU)	6.3E+06	0.0E+00	6.2E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	4.8E-01	0.0E+00	4.8E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	6.8E-03	0.0E+00	6.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	1.2E-02	0.0E+00	1.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	1.9E-04	0.0E+00	1.8E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	6.6E-06	0.0E+00	6.5E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	3.8E-05	0.0E+00	3.7E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	1.0E-05	0.0E+00	1.0E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	8.3E-04	0.0E+00	8.2E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**1.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**3.7E-04**
Offsite SOx Emission (metric ton)	**1.3E-05**
Offsite PM_{10} Emission (metric ton)	**7.5E-05**
Accident Risk - Fatality	**2.0E-05**
Accident Risk - Injury	**1.6E-03**
Water Used (gallons)	**NA**
Energy Used (BTU)	**1.3E+07**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Number of flights taken	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843
CO_2 emission factor (kg/passenger mile)	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01
N_2O emission factor (g/passenger mile)	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03
CH_4 emission factor (g/passenger mile)	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02
NOx emission factor (g/passenger mile)	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01
SO_2 emission factor (g/passenger mile)	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02
PM_{10} emission factor (g/passenger mile)	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Type of rail used	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of trips taken	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
CO_2 emission factor (kg/passenger mile)	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01
N_2O emission factor (g/passenger mile)	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
CH_4 emission factor (g/passenger mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/passenger mile)	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02
SOx emission factor (g/passenger mile)	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01
PM_{10} emission factor (g/passenger mile)	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**

Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (BTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM PERSONNEL TRANSPORTATION	
CO_2 e Emission (metric ton)	1.0E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	3.7E-04
Offsite SOx Emission (metric ton)	1.3E-05

This worksheet allows the user to calculate the environmental footprint of equipment and material transport	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EQUIPMENT TRANSPORTATION - DEDICATED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Account for an empty return trip?	No	No	No	No	No	No	No	No	No	No	No	No
Distance travelled (mi)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DEDICATED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

EQUIPMENT TRANSPORTATION - SHARED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency (ton-mpg)	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SHARED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
CO_2 emission factor (kg/ton mile)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
N_2O emission factor (g/ton mile)	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02
CH_4 emission factor (g/ton mile)	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02
NOx emission factor (g/ton mile)	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00
SOx emission factor (g/ton mile)	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01
PM_{10} emission factor (g/ton mile)	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**

Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02
CO_2 emission factor (kg/ton mile)	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02
N_2O emission factor (g/ton mile)	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04
CH_4 emission factor (g/ton mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/ton mile)	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01
SOx emission factor (g/ton mile)	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01
PM_{10} emission factor (g/ton mile)	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - WATER

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02
CO_2 emission factor (kg/ton mile)	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02
N_2O emission factor (g/ton mile)	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03
CH_4 emission factor (g/ton mile)	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04
NOx emission factor (g/ton mile)	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00
SOx emission factor (g/ton mile)	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01
PM_{10} emission factor (g/ton mile)	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM EQUIPMENT TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EARTHWORK EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Excavator	Excavator	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	135	135	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	Yes	Yes	No	No	No	No	No	No	No	No	No	No
Approximate net power (hp)	150	150	65	65	65	65	65	65	65	65	65	65
Production rate (yd^3/hr)	249	249	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	8	8	5	5	5	5	5	5	5	5	5	5
Equipment operating hours (hr)	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	6.3	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	5.83E+04	5.83E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.74E+00	1.74E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	3.95E+00	3.95E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	3.40E+02	3.40E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	8.80E+01	8.80E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	3.20E+01	3.20E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	4.9E+01	4.9E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	2.5E+01	2.5E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	7.3E+00	7.3E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	8.5E+05	8.5E+05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	4.6E-02	4.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	4.3E-04	4.3E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	6.6E-05	6.6E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	3.8E-05	3.8E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	2.0E-05	2.0E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	5.8E-06	5.8E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	2.7E-04	2.7E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	7.0E-05	7.0E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	7.6E-06	7.6E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	7.2E-08	7.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	1.8E-05	1.8E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BACKHOE, DOZER, AND SCRAPER OPERATION	
CO_2 e Emission (metric ton)	**9.3E-02**
Onsite NOx Emission (metric ton)	**5.4E-04**
Onsite SOx Emission (metric ton)	**1.4E-04**
Onsite PM_{10} Emission (metric ton)	**1.5E-05**
Offsite NOx Emission (metric ton)	**7.7E-05**
Offsite SOx Emission (metric ton)	**4.0E-05**
Offsite PM_{10} Emission (metric ton)	**1.2E-05**
Accident Risk - Fatality	**1.4E-07**
Accident Risk - Injury	**3.6E-05**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**1.7E+00**
Energy Used (MWh)	**NA**

WELL DRILLING EQUIPMENT

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12
Number of injection and extraction points/wells	0	0	0	0	0	0	0	0	0	0	0	0
Drilling method	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push
Drilling fuel consumption rate (gal/hr)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Time spent drilling each injection site (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Total time drilling well (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total fuel consumption during drilling (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (kg/gallon)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
N_2O emission factor (g/gal)	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01
CH_4 emission factor (g/gal)	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01
NOx emission factor (g/gal)	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02
SOx emission factor (g/gal)	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01
PM_{10} emission factor (g/gal)	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01
Offsite NOx emission factor (g/hr)	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00
Offsite SOx emission factor (g/hr)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
Offsite PM_{10} emission factor (g/hr)	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission from drilling (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	ACCIDENT RISK												
	Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DRILLING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRENCHING EQUIPMENT

	Trencher 1	**Trencher 2**	**Trencher 3**	**Trencher 4**	**Trencher 5**	**Trencher 6**	**Trencher 7**	**Trencher 8**	**Trencher 9**	**Trencher 10**	**Trencher 11**	**Trencher 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Equipment operating hours	0	0	0	0	0	0	0	0	0	0	0	0

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

SEDIMENT MANAGEMENT (STAGING AND DRYING)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Is volume input that of saturated sediment?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Will the sediment be dry when this work is performed?	No	No	No	No	No	No	No	No	No	No	No	No
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	Yes	Yes	No	No	No	No	No	No	No	No	No	No
Actual volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Approximate net power (hp)	175	175	175	175	175	175	175	175	175	175	175	175
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05
N_2O emission factor (g/hr)	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00
CH_4 emission factor (g/hr)	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00
Onsite NOx emission factor (g/hr)	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02
Onsite SOx emission factor (g/hr)	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02
Onsite PM_{10} emission factor (g/hr)	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01
Offsite NOx emission factor (g/hr)	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01
Offsite SOx emission factor (g/hr)	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01
Offsite PM_{10} emission factor (g/hr)	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SEDIMENT MANAGEMENT (STAGING AND DRYING)	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

This worksheet allows the user to calculate the environmental footprint of operating pumps on site

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

ELECTRIC PUMP OPERATION - For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pumps or unused methods

		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Method 1 - IF ELECTRICAL USAGE IS KNOWN													
	Pump electrical usage (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
Method 2 - IF PUMP HEAD IS KNOWN													
	Flow rate (gpm)	0	0	0	0	0	0	0	0	0	0	0	0
	Total head (ft)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Pump efficiency	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump times motor efficiency	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Specific gravity	1	1	1	1	1	1	1	1	1	1	1	1
	Pump horsepower (hp)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Method 3 - IF NAME PLATE SPECIFICATIONS ARE KNOWN													
	Pump horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Pump load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
SELECT REGION													
	Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
	CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
	N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
	CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
	NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
	SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
	PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
	Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
	ENERGY OUTPUT												
	Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx and SOx OUTPUT												
	NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRIC PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

DIESEL AND GASOLINE PUMPS

		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
	Fuel type	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
	Horsepower range	100 to 175	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
	Equipment operating hours (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
	Fuel consumption rate (gal/hr)	3.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	BTU per gallon fuel used	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
	CO_2 emission factor (g/hr)	3.6E+04	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02
	N_2O emission factor (g/hr)	6.5E-01	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02
	CH_4 emission factor (g/hr)	1.5E+00	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02
	Onsite NOx emission factor (g/hr)	3.6E+02	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
	Onsite SOx emission factor (g/hr)	6.1E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission factor (g/hr)	3.0E+01	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00
	Offsite NOx emission factor (g/hr)	1.8E+01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01

	Offsite SOx emission factor (g/hr)	9.5E+00	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01
	Offsite PM_{10} emission factor (g/hr)	2.7E+00	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02
	ENERGY OUTPUT												
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL AND GASOLINE PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM PUMP OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of using electrical equipment

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

Equipment Operation - For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Type of equipment	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower
Method 1 - IF NAME PLATE SPECIFICATIONS ARE KNOWN												
Equipment horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
Number of equipments operating	0	0	0	0	0	0	0	0	0	0	0	0
Operating time for each equipment (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Equipment load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - IF ELECTRICAL USAGE IS KNOWN												
Equipment electrical usage, if known (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
SELECT REGION												
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx and SOx OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRICAL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

GENERATORS

	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6	Generator 7	Generator 8	Generator 9	Generator 10	Generator 11	Generator 12
Fuel type	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	100 to 175	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Operating hours (hr)	726	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	3.04E+00	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02
Fuel used (gal)	2208.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	3.8E+04	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02
N_2O emission factor (g/hr)	8.9E-01	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02
CH_4 emission factor (g/hr)	4.6E+01	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NOx emission factor (g/hr)	3.8E+02	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00
SOx emission factor (g/hr)	5.3E+01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01
PM_{10} emission factor (g/hr)	3.1E+01	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Offsite NOx emission factor (g/hr)	1.9E+01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01
Offsite SOx emission factor (g/hr)	9.8E+00	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
Offsite PM_{10} emission factor (g/hr)	2.8E+00	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02
ENERGY OUTPUT												
Energy used (BTU)	3.0E+08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	2.7E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	2.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	7.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	1.4E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	7.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Offsite PM_{10} emission (metric ton)	2.0E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	2.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	3.1E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	2.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM GENERATOR OPERATION	
CO_2 e Emission (metric ton)	2.8E+01
Onsite NOx Emission (metric ton)	2.7E-01
Onsite SOx Emission (metric ton)	3.1E-02
Onsite PM_{10} Emission (metric ton)	2.0E-02
Offsite NOx Emission (metric ton)	1.4E-02
Offsite SOx Emission (metric ton)	7.1E-03
Offsite PM_{10} Emission (metric ton)	2.0E-03
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	3.0E+02
Energy Used (MWh)	NA

TOTAL FROM ELECTRICAL EQUIPMENT OPERATIONS	
CO_2 e Emission (metric ton)	2.8E+01
Onsite NOx Emission (metric ton)	2.7E-01
Onsite SOx Emission (metric ton)	3.1E-02
Onsite PM_{10} Emission (metric ton)	2.0E-02

This worksheet allows the user to calculate the environmental footprint of equipment use	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

AGRICULTURAL EQUIPMENT

	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6	Tillage Tractor 7	Tillage Tractor 8	Tillage Tractor 9	Tillage Tractor 10	Tillage Tractor 11	Tillage Tractor 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area to till (acre)	0	0	0	0	0	0	0	0	0	0	0	0
Soil condition	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil
Soil type	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of tillage (in)	0	0	0	0	0	0	0	0	0	0	0	0
Tractor horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tractor horsepower used	16	16	16	16	16	16	16	16	16	16	16	16
Consumption rate (gal/hr)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Actual equipment operating hours (hr), limited by tractor horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03
N_2O emission factor (g/hr)	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01
CH_4 emission factor (g/hr)	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00
NOx emission factor (g/hr)	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01
SOx emission factor (g/hr)	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00
PM_{10} emission factor (g/hr)	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00
Offsite NOx emission factor (g/hr)	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00
Offsite SOx emission factor (g/hr)	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00
Offsite PM_{10} emission factor (g/hr)	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TRACTOR AND TILLER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CAPPING EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Equipment type	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Calculated area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Actual equipment operating hours (hr), limited by machine horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower used	11	11	11	11	11	11	11	11	11	11	11	11
Consumption Rate (gal/hr)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03
N_2O emission factor (g/hr)	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01
CH_4 emission factor (g/hr)	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01
Onsite NOx emission factor (g/hr)	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01
Onsite SOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Offsite NOx emission factor (g/hr)	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00

Offsite SOx emission factor (g/hr)	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00
Offsite PM_{10} emission factor (g/hr)	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROLLER AND PAVER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

MIXING EQUIPMENT

	Mixer 1	**Mixer 2**	**Mixer 3**	**Mixer 4**	**Mixer 5**	**Mixer 6**	**Mixer 7**	**Mixer 8**	**Mixer 9**	**Mixer 10**	**Mixer 11**	**Mixer 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Volume (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
N_2O emission factor (g/hr)	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02
CH_4 emission factor (g/hr)	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01
Onsite NOx emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite NOx emission factor (g/hr)	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00
Offsite SOx emission factor (g/hr)	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01
Offsite PM_{10} emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM MIXER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**

Energy Used (MWh)	**NA**

INTERNAL COMBUSTION ENGINES

	Engine 1	Engine 2	Engine 3	Engine 4	Engine 5	Engine 6	Engine 7	Engine 8	Engine 9	Engine 10	Engine 11	Engine 12
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Estimated fuel consumption rate (gal or scf/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel used (gal or scf)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon or scf fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal or scf)	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04
N_2O emission factor (g/gal or scf)	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01
CH_4 emission factor (g/gal or scf)	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01
Onsite NOx emission factor (g/gal or scf)	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01
Onsite SOx emission factor (g/gal or scf)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/gal or scf)	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00
Offsite NOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM INTERNAL COMBUSTION ENGINE OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OTHER FUELED EQUIPMENT

	Fuel 1	Fuel 2	Fuel 3	Fuel 4	Fuel 5	Fuel 6	Fuel 7	Fuel 8	Fuel 9	Fuel 10	Fuel 11	Fuel 12
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Volume (scf for Natural gas, gallons for all others)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon or scf	983	983	983	983	983	983	983	983	983	983	983	983
CO2 emission factor (lb/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
N2O emission factor (lb/MMBTU)	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03
CH4 emission factor (lb/MMBTU)	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00
NOx emission factor (lb/MMBTU)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
SOx emission factor (lb/MMBTU)	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04
PM10 emission factor (lb/MMBTU)	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02
Offsite NOx emission factor (g/gal or scf)	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01
Offsite SOx emission factor (g/gal or scf)	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02
Offsite PM_{10} emission factor (g/gal or scf)	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OTHER FUELED EQUIPMENT	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

DIESEL EQUIPMENT (PER HOUR BASIS)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Choose equipment type from drop down menu	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Choose equipment size for Dozer (HP)	65	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1
Choose equipment size for Loader (HP)	65	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Choose equipment size for Excavator (HP)	150	150	150	150	150	150	150	150	150	150	150	150
Choose equipment size for Scraper (HP)	330	330	330	330	330	330	330	330	330	330	330	330
Choose equipment size for Crawler Crane	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1
Choose equipment size for Tillage Tractor (HP)	16	16	16	16	16	16	16	16	16	16	16	16
Choose equipment size for Paver (HP)	25	25	25	25	25	25	25	25	25	25	25	25
Choose equipment size for Roller (HP)	6	6	6	6	6	6	6	6	6	6	6	6
Choose equipment size for Trencher (HP range)	6 to 11	7 to 11	8 to 11	9 to 11	10 to 11	11 to 11	12 to 11	13 to 11	14 to 11	15 to 11	16 to 11	17 to 11
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate equipment size for earthwork equipment	65	65	65	65	65	65	65	65	65	65	65	65
Approximate equipment size for other equipment	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Corrected Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OPERATOR LABOR

	Occupation 1	Occupation 2	Occupation 3	Occupation 4	Occupation 5	Occupation 6	Occupation 7	Occupation 8	Occupation 9	Occupation 10	Occupation 11	Occupation 12
Occupation	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers
Total time worked onsite (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fatality risk per labor hour	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08
Injury risk per labor hour	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OPERATOR LABOR	
CO_2 e Emission (metric ton)	**NA**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	NA
Offsite SOx Emission (metric ton)	NA
Offsite PM_{10} Emission (metric ton)	NA
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (MMBTU)	NA
Energy Used (MWh)	NA

LABORATORY ANALYSIS

	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Analysis 5	Analysis 6	Analysis 7	Analysis 8	Analysis 9	Analysis 10	Analysis 11	Analysis 12
Dollars spent on laboratory analysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy used (MMBTU/$)	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03
CO2 e emission factor (lb/$)	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
NOx emission factor (lb/$)	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03

This worksheet allows the user to calculate the environmental footprint of residual handling

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

RESIDUE DISPOSAL/RECYCLING

	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	Yes	No	No	Yes	No	No	No	No	No	No	No	No
Weight of the waste transported to landfill or recycling (tons)	20.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used	Diesel	Gasoline	Gasoline	Diesel	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Total number of trips	9.1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of miles per trip	50.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total distance traveled (miles)	455.625	0	0	101.25	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	5.4	7.4	7.4	5.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	85.1	0.0	0.0	18.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	139,015	139,015	135,847	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	1.01E+04	9.84E+03	9.84E+03	1.01E+04	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	1.14E-01	2.09E-01	2.09E-01	1.14E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.14E+01	1.18E+01	1.18E+01	1.14E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	1.33E-01	1.33E-01	5.79E-02	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.91E-01	2.65E-01	2.65E-01	2.91E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	1.2E+07	0.0E+00	0.0E+00	2.6E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	8.6E-01	0.0E+00	0.0E+00	1.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	3.0E-03	0.0E+00	0.0E+00	6.7E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	2.0E-02	0.0E+00	0.0E+00	4.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	2.8E-04	0.0E+00	0.0E+00	6.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	4.9E-06	0.0E+00	0.0E+00	1.1E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	7.4E-06	0.0E+00	0.0E+00	1.7E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	3.6E-06	0.0E+00	0.0E+00	7.9E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	2.9E-04	0.0E+00	0.0E+00	6.4E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**1.1E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**3.4E-04**
Offsite SOx Emission (metric ton)	**6.0E-06**
Offsite PM_{10} Emission (metric ton)	**9.1E-06**
Accident Risk - Fatality	**4.3E-06**
Accident Risk - Injury	**3.5E-04**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**1.4E+01**
Energy Used (MWh)	**NA**

LANDFILL OPERATIONS

	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6	Operation 7	Operation 8	Operation 9	Operation 10	Operation 11	Operation 12
Landfill type	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
Waste disposed in landfill (tons)	10.125	0	0	0	0	0	0	0	0	0	0	0
Landfill methane emissions (metric tons CH_4)	0	0	0	0	0	0	0	0	0	0	0	0
Waste disposed in non-hazardous landfill (tons)	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waste disposed in hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy used (MMBTU/ton)	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01
Electricity used (MWh/ton)	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03
CO_2 e emission factor (lb/ton)	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01
NOx emission factor (lb/ton)	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01
SOx emission factor (lb/ton)	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02
PM_{10} emission factor (lb/ton)	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (BTU)	2.2E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	1.1E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	6.4E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	3.4E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	1.8E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM LANDFILL OPERATIONS	
CO_2 e Emission (metric ton)	**1.1E-01**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**6.4E-04**
Offsite SOx Emission (metric ton)	**3.4E-04**
Offsite PM_{10} Emission (metric ton)	**1.8E-03**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**2.2E+00**
Energy Used (MWh)	**NA**

THERMAL/CATALYTIC OXIDIZERS

	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6	Oxidizer 7	Oxidizer 8	Oxidizer 9	Oxidizer 10	Oxidizer 11	Oxidizer 12
Oxidizer type	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Waste gas flow rate (scfm)	0	0	0	0	0	0	0	0	0	0	0	0
Time running (hours)	0	0	0	0	0	0	0	0	0	0	0	0
Input waste gas inlet temperature (F)	0	0	0	0	0	0	0	0	0	0	0	0
Input contaminant concentration (ppmV)	0	0	0	0	0	0	0	0	0	0	0	0
Heat capacity at inlet (BTU/scf - F)	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179
Combustion temperature (F)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Heat exchanger efficiency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heating value for fuel (BTU/scf)	983	983	983	983	983	983	983	983	983	983	983	983
Waste inlet temp after heat exchanger (F)	0	0	0	0	0	0	0	0	0	0	0	0
Waste gas heat content (BTU/scf)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Supplemental heat required (BTU/min)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total fuel consumed (scf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO_2 emission factor (lb/MMBTU)	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02
N_2O emission factor (lb/MMBTU)	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03
CH_4 emission factor (lb/MMBTU)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
Onsite NOx emission factor (lb/MMBTU)	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00
Onsite SOx emission factor (lb/MMBTU)	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04
Onsite PM_{10} emission factor (lb/MMBTU)	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
Offsite NOx emission factor (g/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
Offsite SOx emission factor (g/MMBTU)	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Offsite PM_{10} emission factor (g/MMBTU)	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM THERMAL OXIDIZERS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**1.2E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**9.8E-04**
Offsite SOx Emission (metric ton)	**3.5E-04**

This worksheet allows the user to calculate the water used and GHG emissions from onsite activities

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WATER CONSUMPTION

	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6	Treatment System 7	Treatment System 8	Treatment System 9	Treatment System 10	Treatment System 11	Treatment System 12
Water consumed from municipal water treatment facility (gal)	4400	0	0	0	0	0	0	0	0	0	0	0
Water disposed to wastewater treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Total water consumption (gal)	4400	0	0	0	0	0	0	0	0	0	0	0
Energy consumption (Btu/gal) for water treatment	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00
CO_2 e emission factor (kg/gal) for water treatment	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03
NOx emission factor (g/gal) for water treatment	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03
SOx emission factor (g/gal) for water treatment	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03
PM_{10} emission factor (g/gal) for water treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
Energy consumption (Btu/gal) for wastewater treatment	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01
CO_2 e emission factor (kg/gal) for wastewater treatment	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/gal) for wastewater treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
SOx emission factor (g/gal) for wastewater treatment	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03
PM10 emission factor (g/gal) for wastewater treatment	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04
ENERGY OUTPUT												
Energy used (BTU)	4.0E+04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	1.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	1.9E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	1.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	3.2E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER CONSUMPTION	
CO_2 e Emission (metric ton)	**1.0E-02**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**1.9E-05**
Offsite SOx Emission (metric ton)	**1.2E-05**
Offsite PM_{10} Emission (metric ton)	**3.2E-05**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gal)	**4.4E+03**
Energy Used (MMBTU)	**4.0E-02**
Energy Used (MWh)	**NA**

ONSITE LAND AND WATER RESOURCE CONSUMPTION

	Entire Site 1	Entire Site 2	Entire Site 3	Entire Site 4	Entire Site 5	Entire Site 6	Entire Site 7	Entire Site 8	Entire Site 9	Entire Site 10	Entire Site 11	Entire Site 12
Volume of topsoil brought to site (cubic yards)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of groundwater or surface water lost (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOTAL FROM ONSITE LAND AND WATER RESOURCE CONSUMPTION	
Topsoil consumption (yd^3)	**0.0E+00**
Water loss (gal)	**0.0E+00**

TOTAL FROM RESOURCE CONSUMPTION	
CO_2 e Emission (metric ton)	**1.0E-02**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**1.9E-05**
Offsite SOx Emission (metric ton)	**1.2E-05**
Offsite PM_{10} Emission (metric ton)	**3.2E-05**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Consumption (gal)	**4.4E+03**
Energy Used (MMBTU)	**4.0E-02**
Energy Used (MWh)	**NA**

Environmental Footprint Summary

Activities	CO_2 Emissions	Percent Total	Onsite NOx emissions	Percent Total	Onsite SOx Emissions	Percent Total	Onsite PM_{10} Emissions	Percent Total	Total NOx emissions	Percent Total	Total SOx Emissions	Percent Total	Total PM_{10} Emissions	Percent Total	Total Energy Used	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	MMBTU	%		%		%
Material Productions	8.58	21.95	NA	-	NA	-	NA	-	1.9E-02	6.2	3.5E-02	47.3	7.7E-03	24.1	6.7E+01	16.76	NA	NA	NA	NA
Transportation-Personnel	1.00	2.55	NA	-	NA	-	NA	-	3.7E-04	0.1	1.3E-05	0.0	7.5E-05	0.2	1.3E+01	3.2	2.0E-05	82.0	1.6E-03	81.0
Transportation-Equip/materials	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Equipment Use and Misc	28.32	72.43	2.7E-01	100.0	3.2E-02	100.0	2.0E-02	100.0	2.8E-01	93.3	3.9E-02	52.2	2.2E-02	69.9	3.0E+02	76.0	1.4E-07	0.6	3.6E-05	1.8
Residual Handling	1.20	3.06	0.0E+00	-	0.0E+00	-	0.0E+00	-	9.8E-04	0.3	3.5E-04	0.5	1.8E-03	5.7	1.6E+01	4.1	4.3E-06	17.4	3.5E-04	17.2
Total	39.10	100	2.66E-01	100.0	3.15E-02	100	2.04E-02	100	3.00E-01	100	7.41E-02	100	3.21E-02	100	3.97E+02	100	2.5E-05	100	2.0E-03	100

NA: Not Available or Not Applicable

Environmental Footprint Summary continued

Activities	Water Usage	Percent Total	Electrical Usage	Lost Hours - Injury	Percent Total
	gallons	%	MWH		%
Material Productions	NA	NA	NA	NA	NA
Transportation-Personnel	NA	NA	NA	1.3E-02	81.0
Transportation-Equipment	NA	NA	NA	0.0E+00	-
Equipment Use and Misc	4400.00	100.00	0.00E+00	2.9E-04	1.8
Residual Handling	NA	NA	NA	2.8E-03	17.2
Total	4.40E+03	100	0.00E+00	1.62E-02	100.0

Footprint Reduction

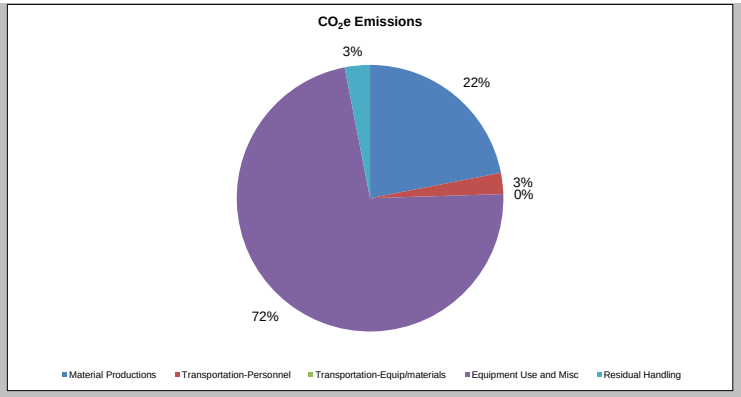
Total electricity replacement (MWh)	0.00E+00
Total electricity replacement (mmBtu)	0.00E+00
Percent electricity from renewable sources (%)	0.0%
Landfill gas reduction (metric ton CO_2 e)	0.00E+00
GHG emissions (metric ton CO2 e)	0.00E+00
NOx emissions (metric ton)	0.00E+00
SOx emissions (metric ton)	0.00E+00
PM10 emissions (metric ton)	0.00E+00
Water consumption reduction (gallons)	0.00E+00

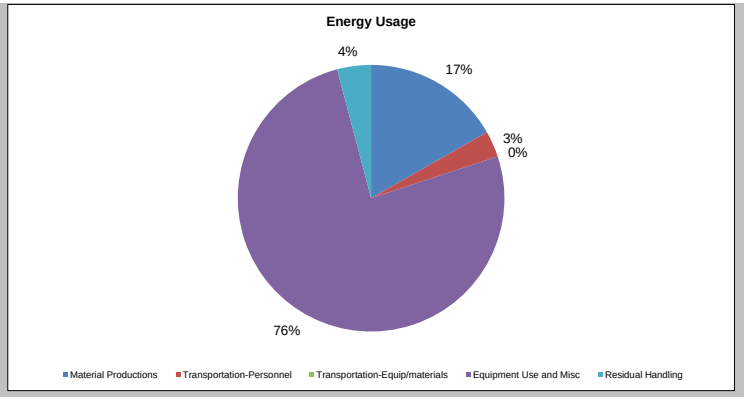
Additional Sustainability Metrics

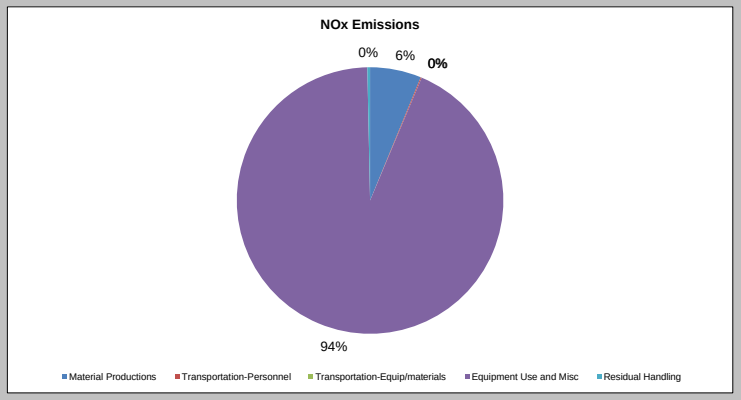
Non-Hazardous Waste Landfill Space (tons)	10.1
Hazardous Waste Landfill Space (tons)	0.0
Topsoil Consumption (yd^3)	0.0
Cost of Phase ($)	0.0
Lost Hours - Injury	0.0

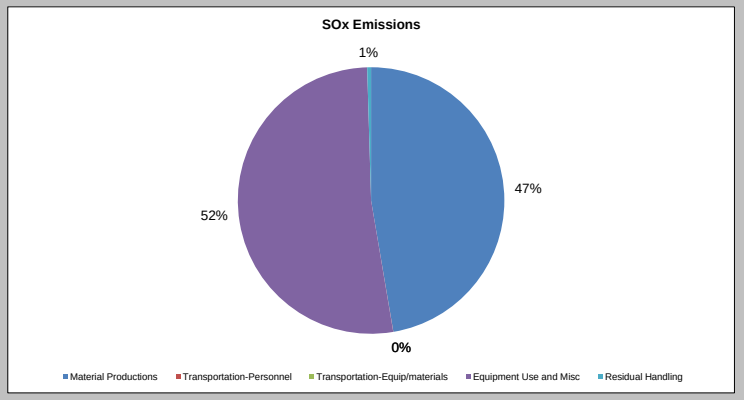
Duration of Phase

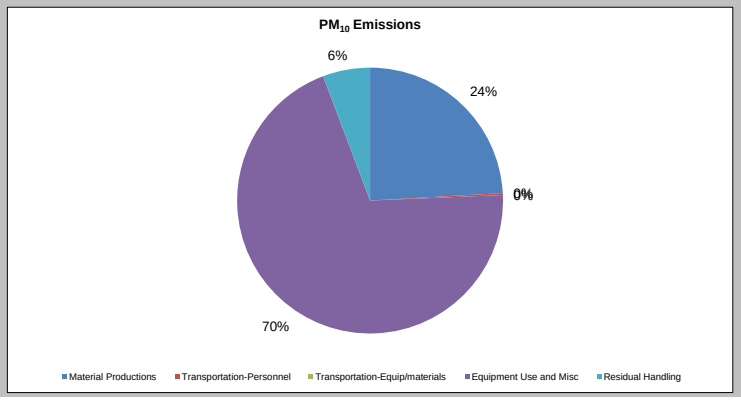
Duration (unit time)	1

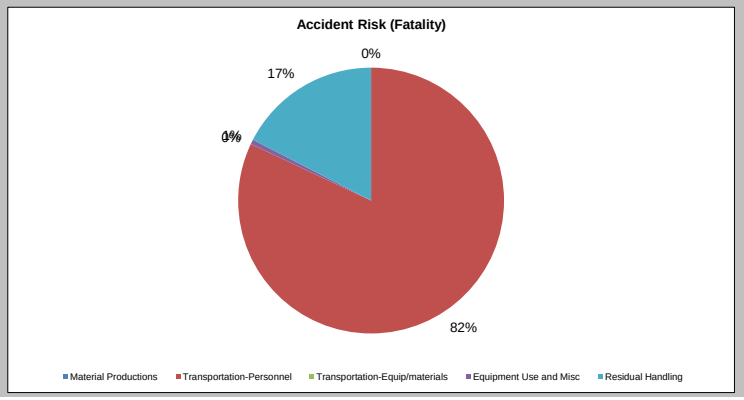

CO_2e Emissions
3%
22%
3%
0%
72%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

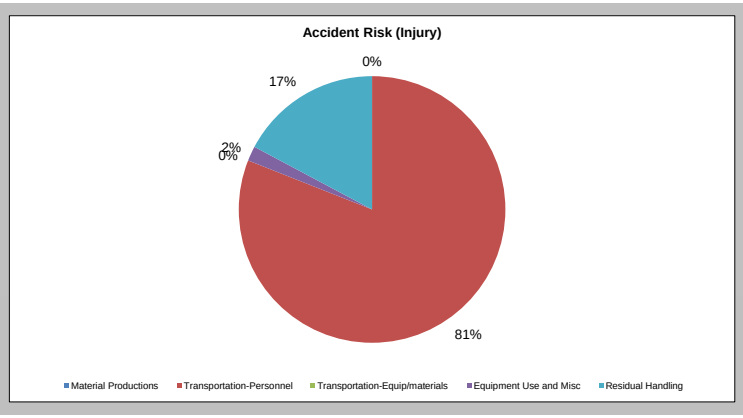

Energy Usage
4%
17%
3%
0%
76%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

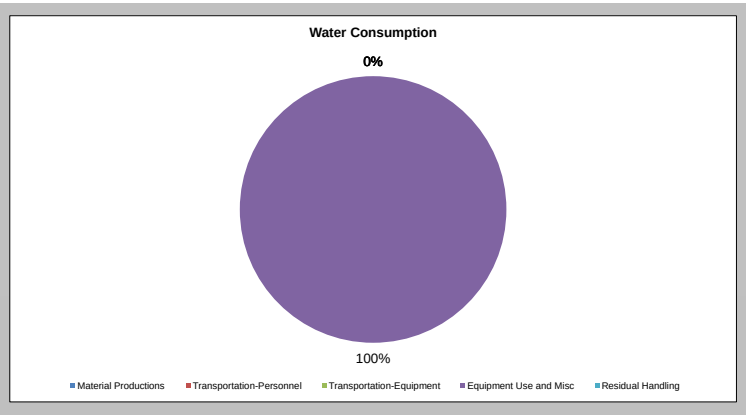

NOx Emissions
0%
6%
0%
94%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


SOx Emissions
1%
47%
52%
0%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


PM_{10} Emissions
6%
24%
0%
0%
70%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Fatality)
0%
17%
0%
0%
82%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Injury)
0%
17%
2%
0%
81%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Water Consumption
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

This worksheet allows the user to calculate the life cycle environmental footprint of the materials used

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WELL MATERIALS

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Specific casing material schedule	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Well diameter from drop down menu (in)	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
Total weight of Sand (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Gravel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Bentonite (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Typical Cement (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of General Concrete (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total weight of Steel (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Casing material type	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC
Weight of casing material (lb/ft)	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02	5.10E-02
Total length of casing material required (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of casing material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00	3.11E+00
NOx emission factor (g/kg)	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00	6.00E+00
SOx emission factor (g/kg)	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00	9.70E+00
PM_{10} emission factor (g/kg)	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00
MJ/kg material	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5	67.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT CHEMICALS & MATERIALS

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Number of injection points	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Amount of material injected at each point (lbs dry mass)	0	0	0	0	0	0	0	0	0	0	0	0
Number of injections per injection point	0	0	0	0	0	0	0	0	0	0	0	0
Total weight of injected material (lbs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total weight of injected material (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00	1.34E+00
NOx emission factor (g/kg)	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00	8.70E+00
SOx emission factor (g/kg)	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00	6.60E+00
PM_{10} emission factor (g/kg)	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00	2.50E+00
MJ/kg material	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT CHEMICALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TREATMENT MEDIA

	TREATMENT 1	TREATMENT 2	TREATMENT 3	TREATMENT 4	TREATMENT 5	TREATMENT 6	TREATMENT 7	TREATMENT 8	TREATMENT 9	TREATMENT 10	TREATMENT 11	TREATMENT 12
Weight of media used (lbs)	0	0	0	0	0	0	0	0	0	0	0	0
Material type	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC
Total weight of media (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00	4.50E+00
NOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
SOx emission factor (g/kg)	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03	9.00E-03
PM10 emission factor (g/kg)	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04
MJ/kg material	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TREATMENT MEDIA PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CONSTRUCTION MATERIALS

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner
Area of material (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of material (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0	965.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00	3.00E+00
NOx emission factor (g/kg)	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00	6.20E+00
SOx emission factor (g/kg)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
PM10 emission factor (g/kg)	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00
MJ/kg material	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM CONSTRUCTION MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**

Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

WELL DECOMMISSIONING

	WELL TYPE 1	WELL TYPE 2	WELL TYPE 3	WELL TYPE 4	WELL TYPE 5	WELL TYPE 6	WELL TYPE 7	WELL TYPE 8	WELL TYPE 9	WELL TYPE 10	WELL TYPE 11	WELL TYPE 12
Number of wells	0	0	0	0	0	0	0	0	0	0	0	0
Depth of wells (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Well diameter (in)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of well (ft^3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Material	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Total volume of material required (ft^3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Density of material (kg/m^3)	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0	1850.0
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02	2.30E-02
NOx emission factor (g/kg)	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02	9.20E-02
SOx emission factor (g/kg)	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01	1.15E-01
PM10 emission factor (g/kg)	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02	4.60E-02
MJ/kg material	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DECOMMISSIONING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

SILT CURTAIN MATERIALS

	CURTAIN 1	CURTAIN 2	CURTAIN 3	CURTAIN 4	CURTAIN 5	CURTAIN 6	CURTAIN 7	CURTAIN 8	CURTAIN 9	CURTAIN 10	CURTAIN 11	CURTAIN 12
Input length or perimeter of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Input depth of silt curtain (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Area of material required (ft^2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/ft^2 material)	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01	1.76E-01
NOx emission factor (g/ft^3)	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01	3.40E-01
SOx emission factor (g/ft^3)	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01	5.50E-01
PM10 emission factor (g/ft^3)	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02	7.94E-02
MJ/ft^2 material	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
CO_2 e emission factor (kg CO_2/linear ft material)	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00	1.97E+00
NOx emission factor (g/linear ft)	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00	4.95E+00
SOx emission factor (g/linear ft)	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00	7.67E+00
PM10 emission factor (g/linear ft)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
MJ/linear ft material	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2	33.2
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SILT CURTAIN MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

BULK MATERIAL QUANTITIES

	MATERIAL 1	MATERIAL 2	MATERIAL 3	MATERIAL 4	MATERIAL 5	MATERIAL 6	MATERIAL 7	MATERIAL 8	MATERIAL 9	MATERIAL 10	MATERIAL 11	MATERIAL 12
Material type	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid	Acetic Acid
Units of quantity	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
Quantity	0	0	0	0	0	0	0	0	0	0	0	0
Density of material (kg/m^3)	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6	1050.6
Total weight of material required (kg)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO_2 e emission factor (kg CO_2/kg material)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
NOx emission factor (g/kg)	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00	4.08E+00
SOx emission factor (g/kg)	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00	6.80E+00
PM10 emission factor (g/kg)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
MJ/kg material	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BULK MATERIALS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM MATERIAL PRODUCTION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**

This worksheet allows the user to calculate the environmental footprint of personnel travel

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

TRANSPORTATION - ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle type	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Distance traveled per trip (miles)	60	0	0	0	0	0	0	0	0	0	0	0
Number of trips taken	10	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	1	0	0	0	0	0	0	0	0	0	0	0
Total distance traveled (miles)	600	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Consumption rate (MPG)	29	29	29	29	29	29	29	29	29	29	29	29
Estimated MPG (input the default if not known)	0	0	0	0	0	0	0	0	0	0	0	0
Total fuel used (gallons)	20.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/mile)	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02	3.67E+02
N_2O emission factor (g/mile)	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02	1.65E-02
CH_4 emission factor (g/mile)	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01	4.46E-01
NOx emission factor (g/mile)	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01	1.41E-01
SOx emission factor (g/mile)	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03	4.97E-03
PM_{10} emission factor (g/mile)	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02	2.86E-02
ENERGY OUTPUT												
Energy used (BTU)	2.9E+06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	2.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	3.1E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	5.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	8.5E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	3.0E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	1.7E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	4.7E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	3.8E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**2.3E-01**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**8.5E-05**
Offsite SOx Emission (metric ton)	**3.0E-06**
Offsite PM_{10} Emission (metric ton)	**1.7E-05**
Accident Risk - Fatality	**4.7E-06**
Accident Risk - Injury	**3.8E-04**
Water Used (gallons)	**NA**
Energy Used (BTU)	**2.9E+06**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Number of flights taken	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843
CO_2 emission factor (kg/passenger mile)	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01	2.10E-01
N_2O emission factor (g/passenger mile)	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03	8.50E-03
CH_4 emission factor (g/passenger mile)	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02	1.04E-02
NOx emission factor (g/passenger mile)	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01	5.90E-01
SO_2 emission factor (g/passenger mile)	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02	5.80E-02
PM_{10} emission factor (g/passenger mile)	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03	3.70E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Type of rail used	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Number of trips taken	0	0	0	0	0	0	0	0	0	0	0	0
Number of travelers	0	0	0	0	0	0	0	0	0	0	0	0
Total passenger miles traveled	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/passenger mile)	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
CO_2 emission factor (kg/passenger mile)	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01	1.30E-01
N_2O emission factor (g/passenger mile)	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
CH_4 emission factor (g/passenger mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/passenger mile)	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02	1.20E-02
SOx emission factor (g/passenger mile)	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01
PM_{10} emission factor (g/passenger mile)	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**

Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (BTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM PERSONNEL TRANSPORTATION	
CO_2 e Emission (metric ton)	2.3E-01
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	8.5E-05
Offsite SOx Emission (metric ton)	3.0E-06

This worksheet allows the user to calculate the environmental footprint of equipment and material transport	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EQUIPMENT TRANSPORTATION - DEDICATED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Vehicle	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck	On road Truck
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Account for an empty return trip?	No	No	No	No	No	No	No	No	No	No	No	No
Distance travelled (mi)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DEDICATED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

EQUIPMENT TRANSPORTATION - SHARED LOAD ROAD

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency (ton-mpg)	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5
Total fuel used (gal)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal)	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04	1.01E+04
N_2O emission factor (g/gal)	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01
CH_4 emission factor (g/gal)	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01	1.14E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02	5.79E-02
PM_{10} emission factor (g/gal)	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01	2.91E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SHARED LOAD ROAD TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - AIR

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of equipment transported (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600	9,600
CO_2 emission factor (kg/ton mile)	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00	1.36E+00
N_2O emission factor (g/ton mile)	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02	4.79E-02
CH_4 emission factor (g/ton mile)	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02	4.17E-02
NOx emission factor (g/ton mile)	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00	4.26E+00
SOx emission factor (g/ton mile)	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01	3.09E-01
PM_{10} emission factor (g/ton mile)	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02	3.24E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM AIR TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**

Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - RAIL

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02	3.05E+02
CO_2 emission factor (kg/ton mile)	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02	4.00E-02
N_2O emission factor (g/ton mile)	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04
CH_4 emission factor (g/ton mile)	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/ton mile)	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01	7.25E-01
SOx emission factor (g/ton mile)	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01
PM_{10} emission factor (g/ton mile)	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02	4.45E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RAIL TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRANSPORTATION - WATER

	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10	Trip 11	Trip 12
Distance travelled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Weight of load (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption rate (BTU/ton mile)	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02	2.78E+02
CO_2 emission factor (kg/ton mile)	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02	4.80E-02
N_2O emission factor (g/ton mile)	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-03
CH_4 emission factor (g/ton mile)	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04	4.89E-04
NOx emission factor (g/ton mile)	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00	1.39E+00
SOx emission factor (g/ton mile)	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01	2.95E-01
PM_{10} emission factor (g/ton mile)	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02	3.67E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (BTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM EQUIPMENT TRANSPORTATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

EARTHWORK EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate net power (hp)	65	65	65	65	65	65	65	65	65	65	65	65
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM BACKHOE, DOZER, AND SCRAPER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

WELL DRILLING EQUIPMENT

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12
Number of injection and extraction points/wells	0	0	0	0	0	0	0	0	0	0	0	0
Drilling method	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push
Drilling fuel consumption rate (gal/hr)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Time spent drilling each injection site (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Total time drilling well (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total fuel consumption during drilling (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (kg/gallon)	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01	1.10E+01
N_2O emission factor (g/gal)	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01	1.23E-01
CH_4 emission factor (g/gal)	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01
NOx emission factor (g/gal)	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02
SOx emission factor (g/gal)	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01	1.42E+01
PM_{10} emission factor (g/gal)	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01	1.06E+01
Offsite NOx emission factor (g/hr)	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00	4.9E+00
Offsite SOx emission factor (g/hr)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
Offsite PM_{10} emission factor (g/hr)	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01	7.4E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission from drilling (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	ACCIDENT RISK												
	Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WELL DRILLING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TRENCHING EQUIPMENT

	Trencher 1	**Trencher 2**	**Trencher 3**	**Trencher 4**	**Trencher 5**	**Trencher 6**	**Trencher 7**	**Trencher 8**	**Trencher 9**	**Trencher 10**	**Trencher 11**	**Trencher 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Equipment operating hours	0	0	0	0	0	0	0	0	0	0	0	0

This worksheet allows the user to calculate the environmental footprint of earthwork activities	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

SEDIMENT MANAGEMENT (STAGING AND DRYING)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Earthwork equipment type	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane	Crawler Crane
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Is volume input that of saturated sediment?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Will the sediment be dry when this work is performed?	No	No	No	No	No	No	No	No	No	No	No	No
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Actual volume of material to be removed (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Approximate net power (hp)	175	175	175	175	175	175	175	175	175	175	175	175
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05	1.38E+05
N_2O emission factor (g/hr)	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00	3.52E+00
CH_4 emission factor (g/hr)	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00	8.00E+00
Onsite NOx emission factor (g/hr)	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02	9.44E+02
Onsite SOx emission factor (g/hr)	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02	2.19E+02
Onsite PM_{10} emission factor (g/hr)	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01
Offsite NOx emission factor (g/hr)	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01	2.0E+01
Offsite SOx emission factor (g/hr)	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01	1.0E+01
Offsite PM_{10} emission factor (g/hr)	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00	3.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM SEDIMENT MANAGEMENT (STAGING AND DRYING)	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

This worksheet allows the user to calculate the environmental footprint of operating pumps on site

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

ELECTRIC PUMP OPERATION - For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pumps or unused methods

		Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Method 1 - IF ELECTRICAL USAGE IS KNOWN													
	Pump electrical usage (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
Method 2 - IF PUMP HEAD IS KNOWN													
	Flow rate (gpm)	0	0	0	0	0	0	0	0	0	0	0	0
	Total head (ft)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Pump efficiency	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump times motor efficiency	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
	Specific gravity	1	1	1	1	1	1	1	1	1	1	1	1
	Pump horsepower (hp)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Method 3 - IF NAME PLATE SPECIFICATIONS ARE KNOWN													
	Pump horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
	Number of pumps operating	0	0	0	0	0	0	0	0	0	0	0	0
	Operating time for each pump (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
	Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Pump load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Pump motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
SELECT REGION													
	Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
	CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
	N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
	CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
	NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
	SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
	PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
	Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
	ENERGY OUTPUT												
	Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx and SOx OUTPUT												
	NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRIC PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

DIESEL AND GASOLINE PUMPS

	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6	Pump 7	Pump 8	Pump 9	Pump 10	Pump 11	Pump 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
Equipment operating hours (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02	8.6E+02
N_2O emission factor (g/hr)	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02	2.1E-02
CH_4 emission factor (g/hr)	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02	4.7E-02
Onsite NOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00
Offsite NOx emission factor (g/hr)	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01	5.3E-01

	Offsite SOx emission factor (g/hr)	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01	2.8E-01
	Offsite PM_{10} emission factor (g/hr)	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02	8.5E-02
	ENERGY OUTPUT												
	Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CO_2 OUTPUT												
	CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	NOx, SOx and PM_{10} OUTPUT												
	Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL AND GASOLINE PUMP OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM PUMP OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the environmental footprint of using electrical equipment	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

Equipment Operation - For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Type of equipment	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower
Method 1 - IF NAME PLATE SPECIFICATIONS ARE KNOWN												
Equipment horsepower (hp)	0	0	0	0	0	0	0	0	0	0	0	0
Number of equipments operating	0	0	0	0	0	0	0	0	0	0	0	0
Operating time for each equipment (hrs)	0	0	0	0	0	0	0	0	0	0	0	0
Percent of maximum speed of motor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Equipment load	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Motor efficiency	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - IF ELECTRICAL USAGE IS KNOWN												
Equipment electrical usage, if known (KWh)	0	0	0	0	0	0	0	0	0	0	0	0
SELECT REGION												
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
CO_2 emission factor (lb/MWh)	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02	6.67E+02
N_2O emission factor (lb/MWh)	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03	7.36E-03
CH_4 emission factor (lb/MWh)	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00	1.56E+00
NOx emission factor (lb/MWh)	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01	6.78E-01
SOx emission factor (lb/MWh)	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01	9.08E-01
PM_{10} emission factor (lb/MWh)	5.07E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01	5.1E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (kWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (MWh)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx and SOx OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ELECTRICAL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**0.0E+00**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**0.0E+00**

GENERATORS

	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6	Generator 7	Generator 8	Generator 9	Generator 10	Generator 11	Generator 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02	6.51E-02
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02	7.2E+02
N_2O emission factor (g/hr)	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02
CH_4 emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NOx emission factor (g/hr)	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00	1.2E+00
SOx emission factor (g/hr)	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01	3.4E-01
PM_{10} emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Offsite NOx emission factor (g/hr)	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01	4.3E-01
Offsite SOx emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
Offsite PM_{10} emission factor (g/hr)	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02	6.8E-02
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM GENERATOR OPERATION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gallons)	NA
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

TOTAL FROM ELECTRICAL EQUIPMENT OPERATIONS	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	0.0E+00
Onsite SOx Emission (metric ton)	0.0E+00
Onsite PM_{10} Emission (metric ton)	0.0E+00

This worksheet allows the user to calculate the environmental footprint of equipment use	
Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

AGRICULTURAL EQUIPMENT

	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6	Tillage Tractor 7	Tillage Tractor 8	Tillage Tractor 9	Tillage Tractor 10	Tillage Tractor 11	Tillage Tractor 12
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area to till (acre)	0	0	0	0	0	0	0	0	0	0	0	0
Soil condition	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil
Soil type	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Depth of tillage (in)	0	0	0	0	0	0	0	0	0	0	0	0
Tractor horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tractor horsepower used	16	16	16	16	16	16	16	16	16	16	16	16
Consumption rate (gal/hr)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Actual equipment operating hours (hr), limited by tractor horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03	6.4E+03
N_2O emission factor (g/hr)	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01	2.4E-01
CH_4 emission factor (g/hr)	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00	9.8E+00
NOx emission factor (g/hr)	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01	1.8E+01
SOx emission factor (g/hr)	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00	3.2E+00
PM_{10} emission factor (g/hr)	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00	1.7E+00
Offsite NOx emission factor (g/hr)	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00	4.1E+00
Offsite SOx emission factor (g/hr)	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00	2.2E+00
Offsite PM_{10} emission factor (g/hr)	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01	6.5E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM TRACTOR AND TILLER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

CAPPING EQUIPMENT

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Equipment type	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller	Roller
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Time available (work days)	0	0	0	0	0	0	0	0	0	0	0	0
Calculated area (ft^2)	0	0	0	0	0	0	0	0	0	0	0	0
Actual equipment operating hours (hr), limited by machine horsepower available	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower required (calculated)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Machine horsepower used	11	11	11	11	11	11	11	11	11	11	11	11
Consumption Rate (gal/hr)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03	6.9E+03
N_2O emission factor (g/hr)	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01	1.7E-01
CH_4 emission factor (g/hr)	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01	3.8E-01
Onsite NOx emission factor (g/hr)	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01	1.5E+01
Onsite SOx emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/hr)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Offsite NOx emission factor (g/hr)	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00	4.3E+00

Offsite SOx emission factor (g/hr)	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00	2.3E+00
Offsite PM_{10} emission factor (g/hr)	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01	6.8E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM ROLLER AND PAVER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

MIXING EQUIPMENT

	Mixer 1	**Mixer 2**	**Mixer 3**	**Mixer 4**	**Mixer 5**	**Mixer 6**	**Mixer 7**	**Mixer 8**	**Mixer 9**	**Mixer 10**	**Mixer 11**	**Mixer 12**
Fuel type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Horsepower range	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Volume (yd^3)	0	0	0	0	0	0	0	0	0	0	0	0
Production rate (yd^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Estimated fuel consumption rate (gal/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel consumption rate (gal/hr)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/hr)	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03	2.3E+03
N_2O emission factor (g/hr)	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02	5.7E-02
CH_4 emission factor (g/hr)	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01	1.3E-01
Onsite NOx emission factor (g/hr)	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00	5.0E+00
Onsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite NOx emission factor (g/hr)	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00	1.5E+00
Offsite SOx emission factor (g/hr)	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01	7.7E-01
Offsite PM_{10} emission factor (g/hr)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM MIXER OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**

Energy Used (MWh)	**NA**

INTERNAL COMBUSTION ENGINES

	Engine 1	Engine 2	Engine 3	Engine 4	Engine 5	Engine 6	Engine 7	Engine 8	Engine 9	Engine 10	Engine 11	Engine 12
Fuel type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Estimated fuel consumption rate (gal or scf/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel used (gal or scf)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon or scf fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/gal or scf)	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04	1.2E+04
N_2O emission factor (g/gal or scf)	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01	2.9E-01
CH_4 emission factor (g/gal or scf)	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01	1.4E+01
Onsite NOx emission factor (g/gal or scf)	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01	8.8E+01
Onsite SOx emission factor (g/gal or scf)	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Onsite PM_{10} emission factor (g/gal or scf)	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00	7.9E+00
Offsite NOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission factor (g/hr)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM INTERNAL COMBUSTION ENGINE OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OTHER FUELED EQUIPMENT

	Fuel 1	Fuel 2	Fuel 3	Fuel 4	Fuel 5	Fuel 6	Fuel 7	Fuel 8	Fuel 9	Fuel 10	Fuel 11	Fuel 12
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Volume (scf for Natural gas, gallons for all others)	0	0	0	0	0	0	0	0	0	0	0	0
BTU per gallon or scf	983	983	983	983	983	983	983	983	983	983	983	983
CO2 emission factor (lb/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
N2O emission factor (lb/MMBTU)	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03
CH4 emission factor (lb/MMBTU)	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00	1.4E+00
NOx emission factor (lb/MMBTU)	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00	2.6E+00
SOx emission factor (lb/MMBTU)	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04	5.9E-04
PM10 emission factor (lb/MMBTU)	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02	1.2E-02
Offsite NOx emission factor (g/gal or scf)	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01	1.4E-01
Offsite SOx emission factor (g/gal or scf)	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02	2.9E-02
Offsite PM_{10} emission factor (g/gal or scf)	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03	6.0E-03
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OTHER FUELED EQUIPMENT	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

DIESEL EQUIPMENT (PER HOUR BASIS)

	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Equipment 10	Equipment 11	Equipment 12
Choose equipment type from drop down menu	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Choose equipment size for Dozer (HP)	65	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1	65.1
Choose equipment size for Loader (HP)	65	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Choose equipment size for Excavator (HP)	150	150	150	150	150	150	150	150	150	150	150	150
Choose equipment size for Scraper (HP)	330	330	330	330	330	330	330	330	330	330	330	330
Choose equipment size for Crawler Crane	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1	awler Crane, 25 ton, 1
Choose equipment size for Tillage Tractor (HP)	16	16	16	16	16	16	16	16	16	16	16	16
Choose equipment size for Paver (HP)	25	25	25	25	25	25	25	25	25	25	25	25
Choose equipment size for Roller (HP)	6	6	6	6	6	6	6	6	6	6	6	6
Choose equipment size for Trencher (HP range)	6 to 11	7 to 11	8 to 11	9 to 11	10 to 11	11 to 11	12 to 11	13 to 11	14 to 11	15 to 11	16 to 11	17 to 11
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input operating hours (hr)	0	0	0	0	0	0	0	0	0	0	0	0
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Approximate equipment size for earthwork equipment	65	65	65	65	65	65	65	65	65	65	65	65
Approximate equipment size for other equipment	0	0	0	0	0	0	0	0	0	0	0	0
Consumption rate (gal/hr)	5	5	5	5	5	5	5	5	5	5	5	5
Corrected Equipment operating hours (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847	135,847
CO_2 emission factor (g/hr)	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04	2.99E+04
N_2O emission factor (g/hr)	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
CH_4 emission factor (g/hr)	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00	2.55E+00
Onsite NOx emission factor (g/hr)	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02	1.66E+02
Onsite SOx emission factor (g/hr)	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01	4.10E+01
Onsite PM_{10} emission factor (g/hr)	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01	2.10E+01
Offsite NOx emission factor (g/hr)	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01	3.1E+01
Offsite SOx emission factor (g/hr)	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01	1.6E+01
Offsite PM_{10} emission factor (g/hr)	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00	4.7E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission - (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM DIESEL EQUIPMENT OPERATION	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

OPERATOR LABOR

	Occupation 1	Occupation 2	Occupation 3	Occupation 4	Occupation 5	Occupation 6	Occupation 7	Occupation 8	Occupation 9	Occupation 10	Occupation 11	Occupation 12
Occupation	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers	Construction laborers
Total time worked onsite (hours)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fatality risk per labor hour	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08	9.2E-08
Injury risk per labor hour	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05	2.3E-05
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM OPERATOR LABOR	
CO_2 e Emission (metric ton)	**NA**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	NA
Offsite SOx Emission (metric ton)	NA
Offsite PM_{10} Emission (metric ton)	NA
Accident Risk - Fatality	0.0E+00
Accident Risk - Injury	0.0E+00
Water Used (gallons)	NA
Energy Used (MMBTU)	NA
Energy Used (MWh)	NA

LABORATORY ANALYSIS

	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Analysis 5	Analysis 6	Analysis 7	Analysis 8	Analysis 9	Analysis 10	Analysis 11	Analysis 12
Dollars spent on laboratory analysis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy used (MMBTU/$)	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03	6.49E-03
CO2 e emission factor (lb/$)	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
NOx emission factor (lb/$)	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03

This worksheet allows the user to calculate the environmental footprint of residual handling

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

RESIDUE DISPOSAL/RECYCLING

	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No	No	No	No	No	No	No
Weight of the waste transported to landfill or recycling (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel used	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Total number of trips	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of miles per trip	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total distance traveled (miles)	0	0	0	0	0	0	0	0	0	0	0	0
Fuel efficiency by weight of load (mpg)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Total fuel used (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BTU per gallon fuel used	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015	139,015
CO_2 emission factor (g/gal)	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03	9.84E+03
N_2O emission factor (g/gal)	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01
CH_4 emission factor (g/gal)	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01	1.18E+01
NOx emission factor (g/gal)	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00	3.27E+00
SOx emission factor (g/gal)	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01	1.33E-01
PM_{10} emission factor (g/gal)	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01	2.65E-01
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ACCIDENT RISK												
Fatality risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Injury risk	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**
Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**0.0E+00**
Accident Risk - Injury	**0.0E+00**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

LANDFILL OPERATIONS

	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6	Operation 7	Operation 8	Operation 9	Operation 10	Operation 11	Operation 12
Landfill type	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous	Non-Hazardous
Region	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY
Waste disposed in landfill (tons)	0	0	0	0	0	0	0	0	0	0	0	0
Landfill methane emissions (metric tons CH_4)	0	0	0	0	0	0	0	0	0	0	0	0
Waste disposed in non-hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waste disposed in hazardous landfill (tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy used (MMBTU/ton)	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01	1.60E-01
Electricity used (MWh/ton)	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03	7.70E-03
CO_2 e emission factor (lb/ton)	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01	2.50E+01
NOx emission factor (lb/ton)	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01	1.40E-01
SOx emission factor (lb/ton)	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02	7.50E-02
PM_{10} emission factor (lb/ton)	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01	4.00E-01
Electricity production efficiency	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%	46.43%
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emissions (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM LANDFILL OPERATIONS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**NA**

Onsite SOx Emission (metric ton)	**NA**
Onsite PM_{10} Emission (metric ton)	**NA**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

THERMAL/CATALYTIC OXIDIZERS

	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6	Oxidizer 7	Oxidizer 8	Oxidizer 9	Oxidizer 10	Oxidizer 11	Oxidizer 12
Oxidizer type	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Fuel type	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Waste gas flow rate (scfm)	0	0	0	0	0	0	0	0	0	0	0	0
Time running (hours)	0	0	0	0	0	0	0	0	0	0	0	0
Input waste gas inlet temperature (F)	0	0	0	0	0	0	0	0	0	0	0	0
Input contaminant concentration (ppmV)	0	0	0	0	0	0	0	0	0	0	0	0
Heat capacity at inlet (BTU/scf - F)	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179	0.0179
Combustion temperature (F)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Heat exchanger efficiency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Heating value for fuel (BTU/scf)	983	983	983	983	983	983	983	983	983	983	983	983
Waste inlet temp after heat exchanger (F)	0	0	0	0	0	0	0	0	0	0	0	0
Waste gas heat content (BTU/scf)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Supplemental heat required (BTU/min)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total fuel consumed (scf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO_2 emission factor (lb/MMBTU)	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02	1.52E+02
N_2O emission factor (lb/MMBTU)	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03	3.66E-03
CH_4 emission factor (lb/MMBTU)	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00	1.35E+00
Onsite NOx emission factor (lb/MMBTU)	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00	2.64E+00
Onsite SOx emission factor (lb/MMBTU)	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04	5.91E-04
Onsite PM_{10} emission factor (lb/MMBTU)	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
Offsite NOx emission factor (g/MMBTU)	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02	1.5E+02
Offsite SOx emission factor (g/MMBTU)	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01	2.9E+01
Offsite PM_{10} emission factor (g/MMBTU)	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00	6.1E+00
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
N_2O emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CH_4 emission (metric ton CO_2 e)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
Offsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Offsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Onsite PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM THERMAL OXIDIZERS	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**
Offsite PM_{10} Emission (metric ton)	**0.0E+00**
Accident Risk - Fatality	**NA**
Accident Risk - Injury	**NA**
Water Used (gallons)	**NA**
Energy Used (MMBTU)	**0.0E+00**
Energy Used (MWh)	**NA**

TOTAL FROM RESIDUAL HANDLING	
CO_2 e Emission (metric ton)	**0.0E+00**
Onsite NOx Emission (metric ton)	**0.0E+00**
Onsite SOx Emission (metric ton)	**0.0E+00**
Onsite PM_{10} Emission (metric ton)	**0.0E+00**
Offsite NOx Emission (metric ton)	**0.0E+00**
Offsite SOx Emission (metric ton)	**0.0E+00**

This worksheet allows the user to calculate the water used and GHG emissions from onsite activities

The different columns allow the user to calculate and compare the emissions for different types of residue such as soil, water, and materials

Yellow cells	value chosen from drop down menu on input sheet
White cells	value entered on input sheet
Orange cells	provide the output of the tool
Blue Cells	tool calculations and automatic lookups

WATER CONSUMPTION

	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6	Treatment System 7	Treatment System 8	Treatment System 9	Treatment System 10	Treatment System 11	Treatment System 12
Water consumed from municipal water treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Water disposed to wastewater treatment facility (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Total water consumption (gal)	0	0	0	0	0	0	0	0	0	0	0	0
Energy consumption (Btu/gal) for water treatment	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00	9.20E+00
CO_2 e emission factor (kg/gal) for water treatment	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03	2.27E-03
NOx emission factor (g/gal) for water treatment	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03	4.40E-03
SOx emission factor (g/gal) for water treatment	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03	2.68E-03
PM_{10} emission factor (g/gal) for water treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
Energy consumption (Btu/gal) for wastewater treatment	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01	1.50E+01
CO_2 e emission factor (kg/gal) for wastewater treatment	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03
NOx emission factor (g/gal) for wastewater treatment	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03	7.26E-03
SOx emission factor (g/gal) for wastewater treatment	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03	6.80E-03
PM10 emission factor (g/gal) for wastewater treatment	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04	7.71E-04
ENERGY OUTPUT												
Energy used (BTU)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CO_2 OUTPUT												
CO_2 e emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
NOx, SOx and PM_{10} OUTPUT												
NOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
SOx emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
PM_{10} emission (metric ton)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

TOTAL FROM WATER CONSUMPTION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Used (gal)	0.0E+00
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

ONSITE LAND AND WATER RESOURCE CONSUMPTION

	Entire Site 1	Entire Site 2	Entire Site 3	Entire Site 4	Entire Site 5	Entire Site 6	Entire Site 7	Entire Site 8	Entire Site 9	Entire Site 10	Entire Site 11	Entire Site 12
Volume of topsoil brought to site (cubic yards)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Volume of groundwater or surface water lost (gal)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOTAL FROM ONSITE LAND AND WATER RESOURCE CONSUMPTION	
Topsoil consumption (yd^3)	0.0E+00
Water loss (gal)	0.0E+00

TOTAL FROM RESOURCE CONSUMPTION	
CO_2 e Emission (metric ton)	0.0E+00
Onsite NOx Emission (metric ton)	NA
Onsite SOx Emission (metric ton)	NA
Onsite PM_{10} Emission (metric ton)	NA
Offsite NOx Emission (metric ton)	0.0E+00
Offsite SOx Emission (metric ton)	0.0E+00
Offsite PM_{10} Emission (metric ton)	0.0E+00
Accident Risk - Fatality	NA
Accident Risk - Injury	NA
Water Consumption (gal)	0.0E+00
Energy Used (MMBTU)	0.0E+00
Energy Used (MWh)	NA

Environmental Footprint Summary

Activities	CO_2 Emissions	Percent Total	Onsite NOx emissions	Percent Total	Onsite SOx Emissions	Percent Total	Onsite PM_{10} Emissions	Percent Total	Total NOx emissions	Percent Total	Total SOx Emissions	Percent Total	Total PM_{10} Emissions	Percent Total	Total Energy Used	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	metric ton	%	MMBTU	%		%		%
Material Productions	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	NA	NA	NA	NA
Transportation-Personnel	0.23	100.00	NA	-	NA	-	NA	-	8.5E-05	100.0	3.0E-06	100.0	1.7E-05	100.0	2.9E+00	100.0	4.7E-06	100.0	3.8E-04	100.0
Transportation-Equip/materials	0.00	-	NA	-	NA	-	NA	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Equipment Use and Misc	0.00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Residual Handling	0.00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Total	0.23	100	0.00E+00	0.0	0.00E+00	0	0.00E+00	0	8.46E-05	100	2.98E-06	100	1.72E-05	100	2.88E+00	100	4.7E-06	100	3.8E-04	100

Environmental Footprint Summary continued

Activities	Water Usage	Percent Total	Electrical Usage	Lost Hours - Injury	Percent Total
	gallons	%	MWH		%
Material Productions	NA	NA	NA	NA	NA
Transportation-Personnel	NA	NA	NA	3.0E-03	100.0
Transportation-Equipment	NA	NA	NA	0.0E+00	-
Equipment Use and Misc	0.00	-	0.00E+00	0.0E+00	-
Residual Handling	NA	NA	NA	0.0E+00	-
Total	0.00E+00	100	0.00E+00	3.01E-03	100.0

Footprint Reduction

Total electricity replacement (MWh)	0.00E+00
Total electricity replacement (mmBtu)	0.00E+00
Percent electricity from renewable sources (%)	0.0%
Landfill gas reduction (metric ton CO_2 e)	0.00E+00
GHG emissions (metric ton CO2 e)	0.00E+00
NOx emissions (metric ton)	0.00E+00
SOx emissions (metric ton)	0.00E+00
PM10 emissions (metric ton)	0.00E+00
Water consumption reduction (gallons)	0.00E+00

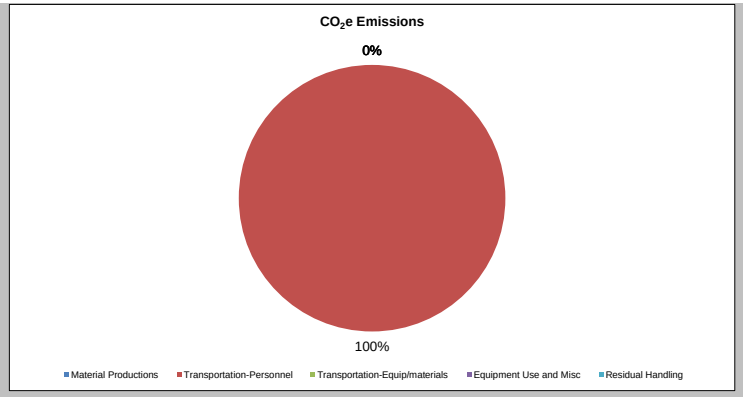
NA: Not Available or Not Applicable

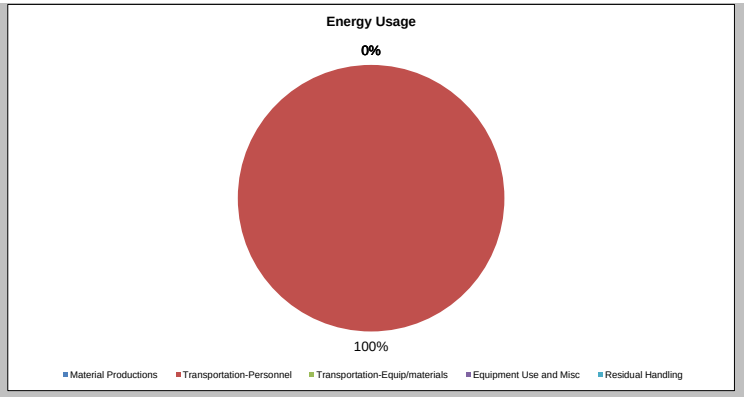
Additional Sustainability Metrics

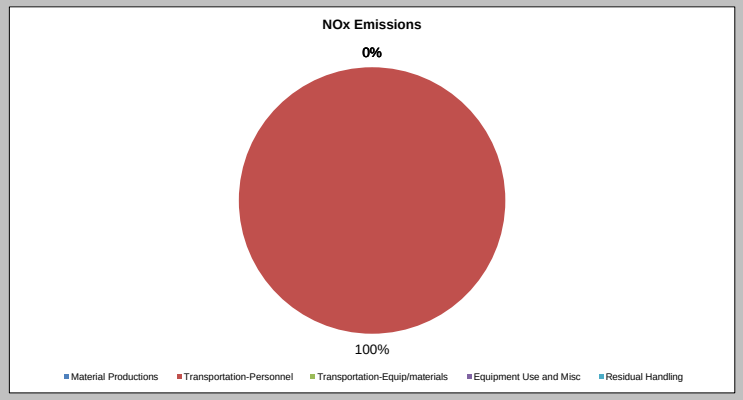
Non-Hazardous Waste Landfill Space (tons)	0.0
Hazardous Waste Landfill Space (tons)	0.0
Topsoil Consumption (yd^3)	0.0
Cost of Phase ($)	0.0
Lost Hours - Injury	0.0

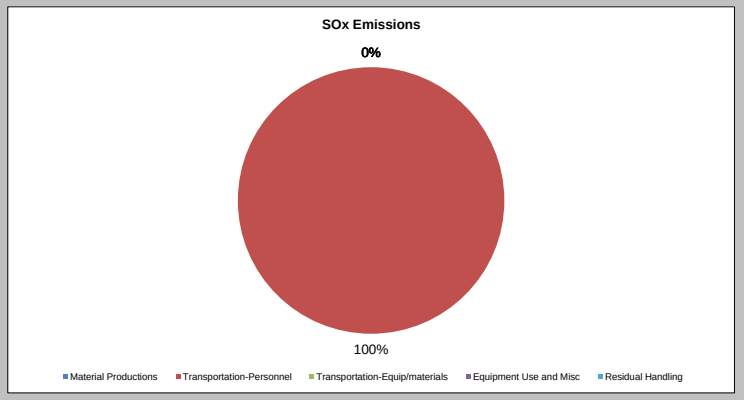
Duration of Phase

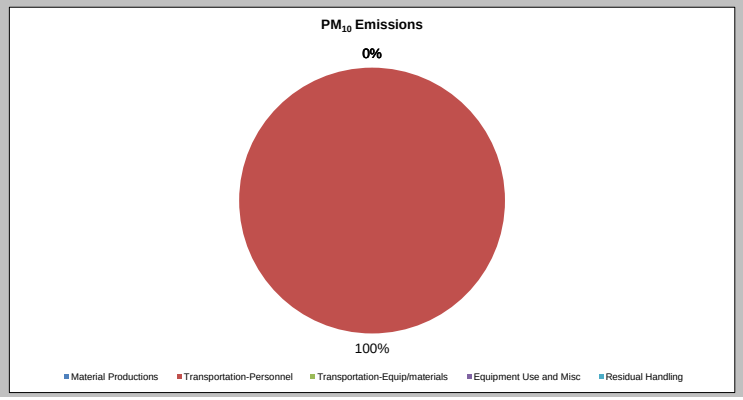
Duration (unit time)	1

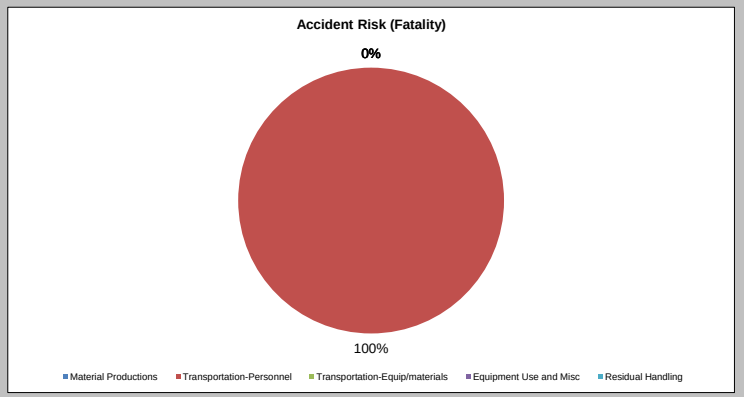

CO_2e Emissions
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

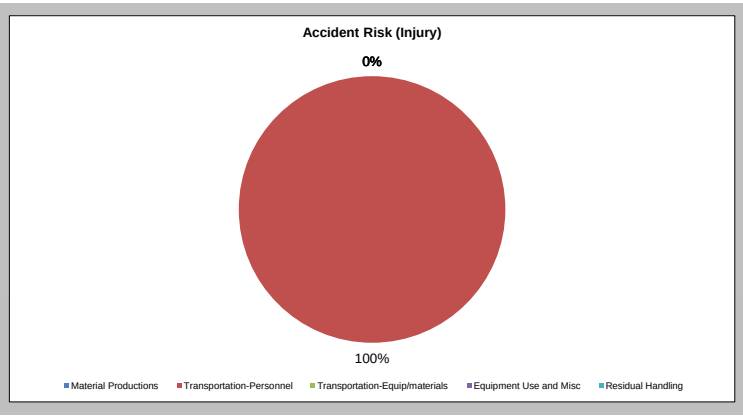

Energy Usage
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling

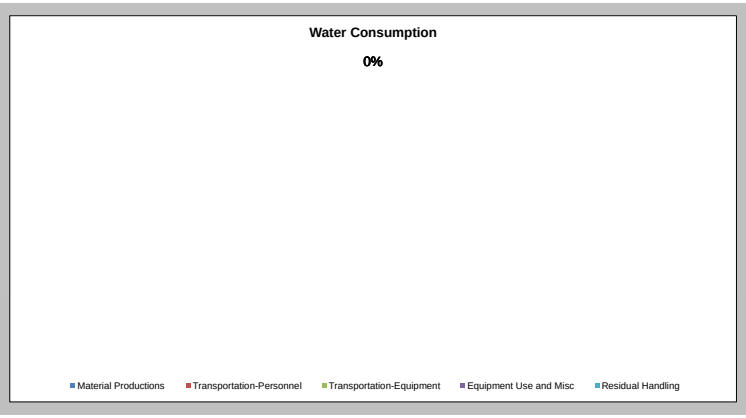

NOx Emissions
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


SOx Emissions
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


PM_{10} Emissions
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Fatality)
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Accident Risk (Injury)
0%
100%
Material Productions
Transportation-Personnel
Transportation-Equip/materials
Equipment Use and Misc
Residual Handling


Water Consumption
0%
Material Productions
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

Climate Screening Checklist

Background Information

- Project Manager: Marlen Salazar
- Site Name: 130 Saint Felix Street Site
- Site Number: BCP Site No. C224306
- Site Location: 130 Saint Felix Street (Portion of Block 2111 Lot 40), Brooklyn, NY
- Site Elevation (average above sea level): Ranges el 43.9 to el 49.32 North American Vertical Datum of 1988 (NAVD88)
- ClimAID Region (Responding Climate Change in New York State (ClimAID) - NYSERDA): Region 4
- Remedial Stage/site classification:

  BCP Remedial Action Work Plan - Class A

- Contamination - Media Impacted/ Contaminants of Concern:
  Contaminant sources include contaminated non-native material and soil with elevated levels of VOCs, SVOCs, metals, and pesticides; groundwater with elevated levels of VOCs, SVOCs, PCBs, and metals; and soil vapor with elevated levels of VOCs.
- Proposed/Current Remedy:
  Combined Track 2/4 Remedy including excavation of soil exceeding the Restricted-Residential Restricted Use Soil Cleanup Objectives, installation of a Site cover system, and collection of confirmation and documentation samples.

- What is the predicted timeframe of the remedy? Will components of the remedy still be in place in 10+ years?

  Yes.

- Is the site in proximity to any sensitive receptors? (e.g. wetlands, waterbodies, residential properties, hospitals, schools, drinking water supplies, etc.)

  Yes.

Is the site in a disadvantaged community (DAC) or potential environmental justice area (PEJA) (Use DECinfolocator: DECinfo Locator (ny.gov))?

☐ **Yes** ■ **No**

If the site is in a DAC or PEJA, will climate impacts be magnified? If yes, list how and why.

☐ **Yes** ☐ **No** N/A

Should thresholds of concern be lowered to account for magnification of impacts? If yes, indicate how lower thresholds will be used in the screening.

☐ **Yes** ■ **No**

Climate Screening Table*

Potential Climate Hazards	**Relevant to the Site Location** (Y/N/NA)[1]	**Projected Change** (Reference data source/Model)[3]	**Potential to Impact Remedy** (Y/N)	**Is remedy/site already resilient?** (Y/N)[4]
Precipitation	Y	N (FEMA RAPT)	N	Y
Temperature[2] (Extreme Heat or Cold Weather Impacts)	Y	Y - 3-7 Day Hazardous Heat (RAPT ArcGIS)	N	Y
Sea Level Rise	N	N (NOAA)	N/A	N/A
Flooding	N	N/A (FEMA Zone X)	N/A	N/A
Storm Surge	N	N/A (NOAA)	N/A	N/A
Wildfire	N	N/A (wildfirerisk.org)	N/A	N/A
Drought	N	N/A (drought.gov)	N/A	N/A
Storm Severity	Y	Y (NCEP at NOAA)	N/A	Y
Landslides	N	N/A	N/A	N/A
Other Hazards:	N	N/A	N/A	N/A

* Links to potential data sources can be found on the following page

[1] If the first column is N --> The rest of the columns will be N/A, the hazard is not applicable to the site.

[2] Extreme Heat: periods of three or more days above 90°F- Extreme Cold: Individual days with minimum temperatures at or below 0 degrees F (NYSERDA ClimAID report)

[3] List the projected change in specific terms or units e.g. inches of rain fall, feet of sea level rise, etc.

[4] If final column is Y, provide reasoning, if the final column is N --> Climate Vulnerability Assessment (CVA) required.

Required Next Steps (If no further action is required, provide justification):

Precipitation and storm severity hazards are not anticipated to impact the remedy. The new building will be designed to prevent water infiltrating the building and stormwater control measures will be incorporated into the site design. Temperature hazards for building residents are not anticipated because the building will be constructed with a central HVAC system.

APPENDIX E

Construction Health and Safety Plan

LANGAN

CONSTRUCTION HEALTH AND SAFETY PLAN

for

130 SAINT FELIX STREET SITE
Brooklyn, New York

NYSDEC BCP Site No. C224306

Prepared For:

130 Saint Felix Street LLC
c/o Gotham Organization, LLC
432 Park Avenue South, 2nd Floor
New York, New York 11771

Prepared By:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
300 Kimball Drive
Parsippany, New Jersey 07054

July 2024
100842301

ENVIRONMENTAL HEALTH AND SAFETY PLAN

Client:	**130 Saint Felix Street, LLC**
Project:	**Construction Oversight During Remediation**
Location:	**130 Saint Felix Street, Brooklyn, New York**
Chemical Hazards:	**Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Pesticides, PCBs, Metals, Per- and polyfluoroalkyl substances (PFAS)**
Prepared By:	**Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.**
Version:	**1**
Date:	**31 July 2024**

Client Contact:	**Bryan Kelly**	**(212) 716-2502**
Langan Project Manager (PM):	**Jessica Friscia**	**(973) 560-4488**
Langan Health & Safety Manager (HSM):	**Tony Moffa, CHMM**	**(215) 491-6545**
Langan Health and Safety Officer (HSO):	**Field Personnel**	
WorkCare:		**1-888-449-7787**
Langan Incident/Injury Hotline:		**(973) 560-4699**

LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C. (LANGAN), AND LANGAN SUBCONTRACTORS, DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE WITHOUT PRIOR RESEARCH AND EVALUATION BY A TRAINED HEALTH AND SAFETY SPECIALIST.

APPROVALS

By signature, the personnel identified below hereby acknowledge that they have reviewed this Construction Health and Safely Plan (CHASP) and agree to comply with the requirements contained therein as well as the applicable provisions of 29 CFR Parts 1910 and 1926. The undersigned also acknowledge and accept that this CHASP is the project CHASP for the site work described in the Remedial Action Plan (RAP). Furthermore, in reviewing and accepting this CHASP, as currently written, the undersigned agree that to the best of their knowledge, this CHASP adequately identifies the activities and hazards associated with work at this site and describes the appropriate and necessary precautions and protections for site workers required by the applicable OSHA statutes and regulations.

Jessica Friscia	7/31/2024
LANGAN Project Manager - PM (Jessica Friscia)	Date
LANGAN Health and Safety Manager (Tony Moffa, CHMM)	Date
LANGAN Health and Safety Officer – HSO	Date

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Attachment B Field Procedures Change Authorization Form
Attachment C Unsafe Conditions and Practices Form
Attachment D Calibration Log
Attachment E NYSDEC DER-10 CAMP
Attachment F CAMP Special Requirements
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Attachment I Safety Data Sheets (SDS)
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1.0 INTRODUCTION

1.1 Purpose and Policy

This Construction Health and Safety Plan (CHASP) has been developed to comply with the regulations under Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response. It addresses foreseeable activities associated with the site work activities to be conducted at the 130 Saint Felix Street in Brooklyn, New York (see Figure 1). This CHASP establishes personnel protection standards and mandatory safety practices and procedures. Additionally, it assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted at known or suspected hazardous waste sites.

Langan personnel involved with inspection of site work activities which involve the displacement of soil, groundwater, and/or material during the proposed development shall comply with the requirements of this CHASP. All Langan personnel engaged in onsite activities will read this document carefully and complete the Safety Briefing Form (Attachment A), a copy of which will be provided to Langan's Project files. Contractors and subcontractors conducting construction-related activities which will disturb or displace soil in the identified AOC are required to develop and follow their own HASP which must be equal or more stringent than the Langan CHASP. Contractors and subcontractors are responsible for their own workers Health and Safety and providing a safe working environment in accordance with all applicable federal, state and local requirements. Each Subcontractor will have a designated Site Health and Safety Manager who will be responsible for ensuring that the designated procedures are implemented in the field. Personnel who have any questions or concerns regarding implementation of this plan are encouraged to request clarification from the Langan Project Manager. Field personnel must follow the designated health and safety procedures, be alert to the hazards associated with working close to vehicles and equipment, and use common sense and exercise reasonable caution at all times.

This CHASP covers construction related field activities which have the potential to disturb and/or displace historic fill material or groundwater impacted with VOCs, SVOCs, pesticides, PCBs, metals and/or PFAS as identified in the 130 Saint Felix Remedial Investigation Report (RIR).

This CHASP was prepared in accordance with the following documents and/or guidelines:

- Occupational Safety and Health Administration (OSHA) regulations for hazardous site workers (29 CFR 1910.120 and 29 CFR 1926); and,
- NIOSH/OSHA/USCG/USEPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.*

Langan's Health and Safety Program and Safe Operating Procedures support this site-specific CHASP.

The level of protection and the procedures specified in this CHASP represent the minimum health and safety requirements to be observed by site personnel engaged in the referenced inspection of construction related activities. Unknown conditions may exist, and known conditions may change. Should an employee find himself or herself in a potentially hazardous situation, the employee will immediately discontinue the hazardous procedures(s) and either personally effect appropriate preventative or corrective measures, or immediately notify the Health and Safety Officer or the Langan Project Manager of the nature of the hazard. In the event of an immediately dangerous or life threatening situation, the employee always has "stop work" authority. Any necessary revision to the Health and Safety procedures will be recorded in the Field Procedure Change Authorization Form (Attachment B) and will require authorization from the Langan Health and Safety Officer and Project Manager.

THE ULTIMATE RESPONSIBILITY FOR THE HEALTH AND SAFETY OF THE INDIVIDUAL EMPLOYEE RESTS WITH THE EMPLOYEE AND HIS OR HER COLLEAGUES. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of the appropriate health and safety personnel as designated above and to follow-up the verbal notification by

completing the Unsafe Conditions and Practices Form provided in Attachment C, a copy of which will be provided to the Langan Health and Safety Officer.

"Extenuating" circumstances such as budget or time constraints, equipment breakdown, changing or unexpected conditions, never justify unsafe work practices or procedures. In fact, the opposite is true. Under stressful circumstances all project personnel must be mindful of the potential to consciously or unconsciously compromise health and safety standards and be especially safety conscious. **ALL SITE PERSONNEL ARE EXPECTED TO CONSIDER "SAFETY FIRST" AT ALL TIMES.**

1.2 Site Descriptions

The approximately 12,519-square feet Site is located at 130 Saint Felix Street in the Fort Greene neighborhood of Brooklyn, New York, and is identified as Block 2111 and Lot 40 on the New York City (NYC) Tax Map. The Site is currently an at-grade asphalt paved parking lot and has been used as a parking lot since at least 1950. The Site is bound to the north by a four-story building occupied by the Brooklyn Music School and a seven-story building occupied by the Brooklyn Academy of Music; Saint Felix Street followed by five 2.75- to three-story residential buildings to the east; the 41-story mixed-use residential/commercial Williamsburgh Savings Bank Tower (1 Hanson Place) and a three-story church building to the south; and Ashland Place followed by a 31-story mixed-use residential/commercial building to the west. The Site is located within a commercial zoning district (C6-1) and is currently designated for garage/gas station use (G6) by the New York City Department of Finance. According to the New York City Department of City Planning zoning map dated 10 December 2019, the Site is located within the Special Downtown Brooklyn District. The Special Downtown Brooklyn District was created to establish special height and setback regulations and urban design guidelines to promote and support the continued growth of Downtown Brooklyn as a unique mixed use area. The Volunteer is applying for a zoning map amendment to change from a C6-1 district to a C6-6 district on the western portion of the Site and from a C6-1 district to a C6-4 district on the eastern portion of the Site.

1.3 Scope of Work

The site work activities which will require the oversight by Langan personnel include the following tasks:

- Task 1 - Excavation and off-site disposal of soil generated during construction as part of the proposed building foundation; and
- Task 2 – Collection of documentation soil samples.

Details of the scopes of work to be completed in each of the work areas for this project are provided within the 130 Saint Felix Remedial Action Work Plan (RAWP).

During construction, all soils excavated or disturbed at the site will be either transported off site for disposal at an approved facility or reused on the subject property pending NYSDEC approval. All soil generated for the previously delineated area of impacted soil (impacted historic fill material) will be excavated and disposed off-site at an approved off-site location. Personnel conducting activities that will contact the impacted historic fill material or impacted groundwater shall abide to the provisions of this CHASP.

2.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

This section specifies the Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) Project Organization.

2.1 Langan Project Manager

The Langan Project Manager (PM) is Jessica Friscia. The PM responsibilities include:

Responsibilities:

- Prepares and organizes the background review of site conditions, the site HASP, and the field team.
- Obtains permission for site access and coordinates activities with appropriate officials.
- Briefs the field team on their specific assignments.
- Coordinates with the Health and Safety Officer (HSO) to ensure that health and safety requirements are met.

- Serves as the liaison with public officials.
- Ensuring that this HASP is developed and approved prior to on-site activities.
- Ensuring that all the tasks in the project are performed in a manner consistent with Langan's comprehensive Health and Safety Program for Hazardous Waste Operations and this HASP.

2.2 Health and Safety Manager (HSM)

The Langan Corporate Health and Safety Manager (HSM) is Tony Moffa. His responsibilities include:

- Serving as a resource in the development and implementation of HASPs;
- Assist in reviewing results of Jobsite Safety Inspections;
- Assisting site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc.;
- Maintaining all records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

2.3 Health and Safety Officer (HSO)

The Langan Health and Safety Officer (HSO) will be identified prior to the start of field work. The HSO responsibilities include:

- Participating in the development and implementation of this HASP;
- Conducting Jobsite Safety Inspections (Attachment J) and correcting any shortcomings in a timely manner;
- Helping to select proper PPE (Personal Protective Equipment) and periodically inspecting it;
- Ensuring that PPE is properly stored and maintained;
- Controlling entry into and exit from the contaminated areas or zones of the site;
- Confirming each team member's suitability for work based on a current physician's recommendation;
- Monitoring the work parties for signs of stress, such as heat stress, fatigue, and cold exposure;
- Monitoring site hazards and conditions;

- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department;
- Resolves conflicting situations which may arise concerning safety requirements and working conditions.
- Conducting daily tailgate meetings to review applicable JSAs as well as check-in with site personnel.

3.0 HAZARDS ANALYSIS

This section presents all assessment of the general, chemical, physical and biological hazards that may be encountered during the tasks specified under this CHASP (Section 1.3). A detail on types of potential contaminants of concerns Langan anticipates to encounter at different locations during the intrusive redevelopment and associated remediation is listed in Tables 1 and 2 of this CHASP.

3.1 General Hazard Assessment

A general hazard assessment was conducted for the required field work described in Section 1.3 and the following potential hazards have been identified:

- Inhalation of volatile contaminants;
- Skin and eye contact with contaminants;
- Ingestion of contaminants;
- Inhalation of dusts impacted with VOCs, SVOCs, pesticides, PFAS, and/or metals;
- Physical hazards associated with the use of heavy equipment;
- Excavation hazards;
- Tripping hazards;
- Noise exposure;
- Heat stress (depending on weather conditions);
- Cold exposure (depending on weather conditions);
- Flammable hazards;
- Electrical hazards; and,
- Use of personal protective equipment.

These hazards are further described in the task-by-task hazard analysis in Table 3. Specific chemical, physical and biological hazards are discussed below.

Mitigation and controls will include as needed work procedures, work/rest regiment, dust control measures, personal protective equipment, and respiratory protection as appropriate.

3.2 Chemical Exposure Hazards

The following chemical hazard evaluation for the proposed site development activities is based on the previous environmental investigations at the site. The evaluation has been conducted to identify chemicals/materials that potentially may be present at the site, and to ensure that work activities, personnel protection, and emergency response are consistent with the specific contaminants that potentially could be encountered.

3.2.1 Specific Chemical Hazards Previously Detected at the Site

Contaminants identified during the investigations completed for the site that may be encountered while conducting site excavation and foundation construction activities include:

- VOCs, SVOCs, pesticides, PFAS, and metals commonly associated with historic urban.

Table 1 lists Contaminants of Concern and potentially affected media. The potential contaminants that might be encountered during the field activities and the exposure limits are listed in Table 2.

3.2.2 Chemical Hazard Exposure Routes

Potential hazards and their exposure routes include:

- Inhalation of organic vapors due to the presence of volatile organic compounds from diesel-powered equipment.

- Inadvertent ingestion of potentially toxic substances via hand to mouth contact or deliberate ingestion of materials inadvertently

contaminated with potentially toxic materials such as SVOCs, pesticides, and/or metals.

- Skin and eye contact with contaminants at the site and decontamination activities.

Exposure limits and health effects of selected chemicals are in Table 2. The probability of exposure for each task is outlined in Table 3.

3.2.3 Control of Exposure to Chemical Hazards

To protect potentially exposed personnel the following procedures and protocols will be adopted and used as needed: work procedures will be adhered to, work zones will be established, dust control will be utilized, respirators (if required) and personal protective equipment will be worn, area air monitoring will be conducted during times of disturbance of the impacted fill material and strict personnel decontamination procedures will be followed.

3.3 Physical Hazards

3.3.1 Temperature Extremes

Hot Temperatures

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE, in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. If onsite workers exhibit the signs of heat exhaustion or heat stroke, they should seek immediate medical attention.

Cold Temperatures

Workers may be exposed to the hazard of working in a cold environment. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, poor judgment, and unauthorized procedural changes. In order to prevent frostbite, hypothermia, trench foot and immersion foot, the workers are responsible for dressing warmly in layers with thick socks, gloves, and appropriate head and face gear. Upon the onset of discomfort due to the cold, onsite workers should take regular five to ten minute breaks to warm up inside nearby buildings and to drink warm

fluids. Please note that the NYCDEP statute prohibits idling an engine for more than three minutes (one-minute if adjacent to a school). This statue includes the use of a vehicle for the purpose of warming up employees. As such, all contractors and employees shall identify a place to warm up in advance. If discomfort continues and the onsite workers start to exhibit the signs of frostbite, hypothermia, trench foot or immersion foot, they should seek immediate medical attention.

3.3.2 Noise and Air Resources

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Hearing protection is required and shall be used in designated areas of the site as indicated by the posted signs.

3.3.3 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Hand and power tools will be inspected prior to use. Proper personal protective equipment shall be worn while utilizing hand and power tools. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

3.3.4 Slips, Trips, and Falls

Working in and around the site will pose slip, trip and fall hazards due to equipment, piping, slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Potential adverse health effects include falling to the ground and becoming injured or twisting an ankle. Good housekeeping at the site must be maintained at all times.

3.3.5 Fire and Explosion

Prior to starting all excavation work, a review of appropriate New York City maps will be conducted to identify potential hazards. The possibility of encountering fire and explosion hazards exists from underground utilities and gases. Therefore, all excavation equipment must be grounded.

3.3.6 Material Handling

Manual lifting of heavy objects may be required. Failure to follow proper lifting techniques can result in back injuries and strains. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

Whenever possible, heavy objects must be lifted and moved by mechanical devices rather than by manual effort. The mechanical devices will be appropriate for the lifting or moving task and will be operated only by trained and authorized personnel. Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects, such as a Master Rigger or equivalent. Lifting devices, including equipment, slings, ropes, chains, and straps, will be inspected, certified, and labeled to confirm their weight capacities. Defective equipment will be taken out of service immediately and repaired or destroyed.

The wheels of any trucks being loaded or unloaded, and/or parked on an incline, will be chocked to prevent movement. If applicable, outriggers will be extended on a flat, firm surface during operation. The lift and swing path of a crane/equipment will be watched and maintained clear of obstructions. Personnel will not pass under a raised load, nor will a suspended load be left unattended. Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers.

All reciprocating, rotating, or other moving parts will be guarded at all times. Accessible fire extinguishers will be made available in all mechanical lifting devices. All material must be stored in tiers, racked, blocked, or otherwise secure to prevent sliding, falling, or collapse. All loads/material will be verified to be secure before transportation.

3.3.7 Confined Space/Excavation Hazards

Personnel entry into trenches or unshored (*e.g.,* lagging) excavations within the designated areas of concern will not be permitted. No other confined spaces are known to exist on Site. If entry into trenches or excavations is required, all work will stop until the CHASP has been revised to address the new hazards.

3.3.8 Working Near Equipment

Personnel working in the immediate vicinity of heavy equipment (*e.g.*, excavators, loaders, etc.) may encounter physical hazards resulting from contact with equipment. Field personnel should be aware of the presence of these hazards at all times and take appropriate action to avoid them. Due to the limited ability to communicate when wearing respiratory protection, the risk is increased. Workers must be careful to communicate with heavy equipment operators regarding their location, and should maintain a safe distance from operating equipment at all times. Prior to working around equipment, the site personnel will review appropriate hand signals with the operator.

Equipment will be equipped with back up alarms.

3.3.9 Electrical Safety

Personnel may utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

3.3.10 Utilities

Prior to the start of any intrusive work, the location of above-ground and underground utilities and other structures will be completed by the contractor/subcontractor responsible for completing construction activities.

3.3.11 Vehicular Traffic

Portions of site activities (load in and load out) will be conducted in the street so vehicular and pedestrian traffic will be present. Appropriate precautions to protect the on-site workers and civilians should be used including the use of cones and traffic vests as appropriate.

3.4 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals and insects. As the potential for exposure to blood borne pathogens during implementation of the RAWP is anticipated to be low, a Blood Borne Pathogen Exposure Plan (BBPEP) is not required. A BBPEP will be prepared if site operation requires its implementation.

3.4.1 Animals

During site operations, animals such as dogs, cats, pigeons, mice, and rats may be encountered. Workers shall use discretion and avoid all contact with animals. Bites and scratches from dogs and cats can be painful and if the animal is rabid, the potential for contracting rabies exists. Contact with rat and mice droppings may lead to contracting hantavirus. Inhalation of dried pigeon droppings may lead to psittacosis. Cryptococcosis and histoplasmosis are also diseases associated with exposure to dried bird droppings but these are less likely to occur in this occupational setting.

3.4.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, spiders, and ticks may be present at the site. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. In addition, mosquito bites may lead to St. Louis encephalitis or West Nile encephalitis.

3.4.3 Wound Care

A source of occupational exposure may occur when an employee gives First Aid and or CPR to an individual who had infectious blood. The occupational exposure occurs when there is the possibility for an employee's eyes, mucous membranes, non-intact skin (i.e., cut and abraded skin) to come into contact with potentially infectious materials from another employee. If an accident were to occur where First Aid would need to be administered, the person administering the First Aid will presume that any wounds and materials used are contaminated with BBP and should wear the appropriate PPE to prevent contact with these materials. Additionally, should the use of First Aid materials and or

clothing that was potentially contaminated with BBP be encountered these materials should be property containerized and transported to the nearest hospital for proper disposal.

3.5 Coronavirus

General Preventative Measures

Field personnel must follow general proper hygiene measures while in the field including:

- Avoid touching eyes, nose and mouth.
- Cover cough or sneeze with tissue and throw in trash.
- Wash hands often with soap and water for 20 seconds after going to bathroom, before eating, after blowing nose, coughing or sneezing.
- Use hand sanitizer with at least 60% alcohol if soap and water are not available.
- Avoid physical contact with other people (e.g., no handshakes).
- Maintain a safe distance of at least 6 feet from other people (social distancing).
- Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

Construction Trailers

Employees should avoid use of shared construction trailers or where employees cannot maintain a safe distance (minimum 6 feet) from other workers. If trailer use is needed, areas such as desks, phones, chairs and other common areas, should be cleaned and disinfected before and after use. Protocols should be developed to minimize trailer use to essential personal, restrict use from any workers who are ill or showing symptoms of being ill, use if face coverings and ensure a safe distance of 6 feet can be established between workers.

Communication

Include Coronavirus topics and prevention topics in daily tailgate meetings to ensure Coronavirus awareness is communicated daily. Discussions can focus on general topics including: social distancing, prevention measures for field personnel, signs and symptoms and recent news on the Coronavirus. Site-specific topics should include minimizing face-to-face contact, disinfecting/ sterilizing field equipment, use of PPE to reduce exposure, site security, use of face coverings and other potential exposure issues/concerns.

Sick/Ill Workers

No Langan employee is permitted to be onsite when ill and/or showing potential symptoms of the Coronavirus. Symptoms of the Coronavirus may appear 2-14 days after exposure and can range from mild to severe. The most common symptoms include: fever, fatigue, dry cough, shortness of breath chills, repeated shaking with chills, muscle pain, headache, sore throat, or new loss of taste or smell. If an employee or subcontractor is observed being ill or exhibiting symptoms of Coronavirus, employees must immediately utilize their Stop Work Authority and contact their project manager to address the situation. If an employee observes another worker onsite exhibiting symptoms of Coronavirus, immediately utilize Stop Work Authority and notify their project manager and site construction manager or safety officer. Work should resume when the safety and health of Langan and subcontractors is adequately addressed.

3.6 Task Hazard Analysis

The tasks to be completed during the proposed site work activities, as summarized in Section 1.3, are listed in Table 3 with a Hazard Analysis for each task.

4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

4.1 Levels of Protection

PPE must protect workers from the specific hazards they are likely to encounter on site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and, (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards. Based on anticipated site conditions and the proposed work activities to be performed at the Site, Level D Protection will be used. The upgrading/downgrading of these levels of protection will be based on continuous air monitoring results as described in Section 5.0. The decision to modify standard PPE will be made by the HSO after conferring with the Langan Project Manager. The levels of protection are described below.

- **Level D Protection**

  a. Safety glasses with sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Hard hat
  d. Long sleeve work shirt and work pants
  e. Nitrile gloves
  f. Hearing protection (as needed)
  g. Reflective traffic vest

- **Level D Protection (Modified)**

  a. Safety glasses with sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Disposable chemical-resistant boot covers
  d. Coveralls (polycoated Tyvek or equivalent to be worn when contact with wet contaminated soil, groundwater, or non-aqueous phase liquids is anticipated)
  e. Hard hat
  f. Long sleeve work shirt and work pants
  g. Nitrile gloves
  h. Hearing protection (as needed)
  i. Reflective traffic vest

- **Level C Protection**

  a. Full face-piece, air-purifying, cartridge*-equipped, NIOSH-approved respirator [*combo cartridge P100/OV/CL/HC/SD/CD/HS (escape)]
  b. Inner (latex) and outer (nitrile) chemical-resistant glove
  c. Chemical-resistant safety boots/shoes (toe-protected)
  d. Disposable chemical-resistant boot covers
  e. Hard hat
  f. Long sleeve work shirt and work pants
  g. Coveralls (Tyvek or equivalent, poly-coated Tyvek will be worn when contact, or anticipated contact with wet contaminated soils, ground water, and/or non-aqueous phase liquids (NAPL) is anticipated)
  h. Hearing protection (as needed)
  i. Reflective traffic vest

The action levels used in determining the necessary levels of respiratory protection and upgrading to Level C are provided in Table 4. The written Respiratory Protection Program is maintained by Langan's H&S Department. The monitoring procedures and equipment are outlined in Section 5.0.

4.2 Respirator Fit-Test

All Langan employees and subcontractors performing site work who could be exposed to hazardous substances at the work site are in possession of a full face-piece, air-purifying respirator and have been successfully quantitative fit-tested within the past year. Quantitative fit-test records are maintained by Langan's H&S Department.

4.3 Respirator Cartridge Change-Out Schedule

Respiratory protection is required to be worn when certain action levels (Table 2) are reached. A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first.
- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short the time period was the previous day they were used.

5.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

5.1 Monitoring During Site Operations

Atmospheric air monitoring results are used to provide data to determine when exclusion zones need to be established and when certain levels of personal protective equipment are required. For all instruments there are Site-specific action level criteria which are used in making field health and safety determinations. Other data, such as the visible presence of contamination or the

steady state nature of air contaminant concentration, are also used in making field health and safety decisions. Therefore, the HSO may establish an exclusion zone or require a person to wear a respirator even though atmospheric air contaminant concentrations are below established CHASP action levels.

During site work involving disturbance of soil/fill at the site, real time air monitoring will be conducted for VOCs and dust. A photoionization detector (PID) and/or flame ionization detector (FID) will be used to monitor concentrations of VOCs at personnel breathing-zone height. Dust monitoring will be accomplished with an aerosol monitor. Air monitoring will be the responsibility of the HSO or designee. Air monitoring will be conducted approximately every 30 minutes during ground intrusive activities on the project site. All manufacturers' instructions for instrumentation and calibration will be available onsite.

Subcontractors' air monitoring plans must be equal or more stringent as the Langan plan.

An air monitoring calibration log is provided in Attachment D of this CHASP. Additional air monitoring information is provided in Section 6.0, as detailed below.

5.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 2000 (10.6v) or equivalent will occur during intrusive work within the work zone and at the downwind perimeter of the work zone. Colormetric Indicator Tubes for benzene may be used as backup for the PID, if measurements remain above background monitor every 2 hours. The HSO will monitor the employee breathing zone <u>at least</u> every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, etc.) since the last measurement. If VOC levels are observed above 5 ppm for longer than 5 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the workzone every 30 minutes in addition to the employee breathing zone. Instrument action levels for monitored gases are provided in Table 4.

5.1.2 Dust

During invasive procedures which have the potential for creating airborne dust, such as excavation of dry soils, a real time airborne dust monitor such as a Thermo Personal DataRam (pDR) or a TSI DustTrak should be used to monitor for air particulates. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (appearance of visible dust) since the last measurement. If dust levels are observed to be greater than 0.100 mg/m^3 or visible dust is observed for longer than 15 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the AOC every 30 minutes in addition to the employee breathing zone. Instrument action levels for dust monitoring are provided in Table 4.

5.2 Monitoring Equipment Calibration and Maintenance

Instrument calibration shall be documented and included in a dedicated safety and health logbook or on separate calibration pages of the field book. All instruments shall be calibrated before and after each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

All instruments shall be operated in accordance with the manufacturers' specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on site by the HSO for reference.

5.3 Determination of Background Levels

Background (BKD) levels for VOCs and dust will be established prior to intrusive activities within the AOC at an upwind location. A notation of BKD levels will be referenced in the daily monitoring log. BKD levels are a function of prevailing conditions. BKD levels will be taken in an appropriate upwind location as determined by the HSO.

Table 4 lists the instrument action levels.

6.0 COMMUNITY HEALTH AND SAFETY CONSIDERATIONS

Community air monitoring will be conducted in compliance with the NYSDOH Generic Community Air Monitoring Program (CAMP) outlined below.

The CAMP will include real-time monitoring for VOCs and particulates at the downwind perimeter of each designated work area when ground-intrusive work is in progress. Continuous monitoring will be required for all ground-intrusive work. Ground-intrusive work includes, but is not limited to, soil/fill excavation and handling and utility trenching. Periodic monitoring for VOCs may be required during non-intrusive work such as the collection of soil samples. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location and taking a reading prior to leaving a sample location.

CAMP monitoring of total VOC levels will be conducted using PIDs, and monitoring for particulates will be conducted using particulate sensors equipped with filters that can detect airborne particulates less than 10 microns in diameter (PM10). Monitoring for particulates and odors will be conducted during ground-intrusive work by a field engineer, scientist, or geologist under the supervision of the RE. The work zone is defined as the general area in which machinery is operating in support of remediation. A portable PID will be used to monitor the work zone and for periodic monitoring of total VOC levels during work such as soil sampling. The site perimeter will be visually monitored for fugitive dust emissions.

The following actions will be taken based on total VOC levels measured:

- If total VOC levels exceed 5 ppm above background for the 15-minute average at the perimeter, work will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work will resume with continued monitoring.
- If total VOC levels at the downwind perimeter of the work zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work will resume provided that the total VOC level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.

- If the total VOC level is above 25 ppm at the perimeter of the hot zone, work will be shut down.

The following actions will be taken based on dust levels measured or visual dust observations:

- If the downwind particulate level is 100 µg/m³ greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 µg/m³ above the background level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 µg/m³ above the background level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 µg/m³ of the upwind level and in preventing visible dust migration.

Sustained concentrations of VOCs or PM10 will be reported to the NYSDEC and NYSDOH Project Managers and included in the daily report. CAMP exceedances and corrective measures taken will be reported to NYSDEC and NYSDOH project managers within 24 hours of occurring and included in the daily reports. All CAMP data will provided to NYSDEC and NYSDOH project managers either as part of the daily report or as a separate file. In addition, a map showing the location of the CAMP station and work zone air monitoring station will be included in the daily report. Air monitoring operations, referred to as the CAMP, will comply with NYSDEC DER-10 Appendix 1A and Appendix 1B, included as Attachment E. Additional special requirements for work within 20 feet of potentially exposed individuals or structures are included as Attachment F.

7.0 WORK ZONES AND DECONTAMINATION

7.1 Site Control

Work zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas.

Any person working in an area where the potential for exposure to site contaminants exists will only be allowed access after providing the HSO with proper training and medical documentation.

Exclusion Zone (EZ) - All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an EZ. Decontamination of field equipment will also be conducted in the Contaminant Reduction Zone (CRZ) which will be located on the perimeter of the EZ. The EZ and the CRZ will be clearly delineated by cones, tapes or other means. The HSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

7.2 Contamination Control

7.2.1 Personnel Decontamination Station

Personal hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

7.2.2 Minimization of Contact with Contaminants

During completion of all site activities, personnel should attempt to minimize the chance of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination as PPE is intended to minimize accidental contact. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

Field procedures will be developed to control over spray and runoff and to ensure that unprotected personnel working nearby are not affected.

7.2.3 Personnel Decontamination Sequence

Decontamination will be performed by removing all PPE used in EZ and placing it in drums/trash cans at the CRZ. Baby wipes shall be available for wiping hands and face. Drums/trash cans will be labeled by the field

crews in accordance with all local, state, and federal requirements. Management plans for contaminated PPE, tools and Investigative Derived Waste (i.e., soil cutting) are provided below.

7.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination and wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment. If the injured person can be moved, he/she will be decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury), provisions shall be made to ensure that emergency response personnel will be able to respond to the victim without being exposed to potentially hazardous atmospheric conditions. If the potential for inhalation hazards exist, such as with open excavation, this area will be covered with polyethylene sheeting to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent data.

7.2.5 Hand-Held Equipment Decontamination

Hand-held equipment includes all monitoring instruments as stated earlier, samples, hand tools, and notebooks. The hand-held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the CRZ.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or paper towels if contamination is visually evident. Sampling equipment, hand tools, etc. will be cleaned with non-phosphorous soap to remove any potentially contaminated soil and rinsed with deionized water. All decontamination fluids will be containerized and stored on-site pending waste characterization sampling and appropriate off-site disposal.

7.2.6 Heavy Equipment Decontamination

All heavy equipment and vehicles arriving at the work site will be free from contamination from offsite sources. Any vehicles arriving to work that are suspected of being impacted will not be permitted on the work site. Potentially contaminated heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the HSO or his designee.

7.3 Communications

The following communications equipment will be utilized as appropriate.

- Telephones - A cellular telephone will be located with the HSO for communication with the HSM and emergency support services/facilities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

Signal	Meaning
Hand gripping throat	Out of air, can't breathe
Grip on partner's wrist or placement of both hands around partner's waist	Leave area immediately, no debate
Hands on top of head	Need assistance
Thumbs up	Okay, I'm all right, I understand
Thumbs down	No, negative

8.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances will be required to have passed an initial baseline medical examination, with annual follow-up medical exams thereafter, consistent with 29 CFR 1910.120(f). Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Results of medical evaluations are maintained by Langan's H&S Department.

9.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures. In case of emergency, in addition to 911 the Langan Incident/Injury Hotline (973-560-4699) should be called as soon as possible.

9.1 Responsibilities

9.1.1 Health and Safety Officer (HSO)

The HSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The HSO is responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The HSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can notify OSHA within the required time frame.

9.1.2 Emergency Coordinator

The HSO or their designated alternate will serve as the Emergency Coordinator. The Emergency Coordinator is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. They are also responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The Emergency Coordinator is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized.

The Emergency Coordinator shall locate emergency phone numbers and identify hospital routes prior *to beginning* work on the sites. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator is responsible for implementing the Emergency Response Plan.

9.1.3 Site Personnel

Project site personnel are responsible for knowing the Emergency Response Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency. Project site personnel, including all subcontractors will be trained in the Emergency Response Plan.

9.2 Communications

Once an emergency situation has been stabilized or as soon as practically possible, the HSO will contact the Langan Incident/Injury Hotline (973-560-4699) and Project Manager of identify any emergency situation.

9.3 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during investigative activities at the site, Attachment G will be available in the field vehicles and provided to all personnel conducting work within the EZ.

Figure 3 shows the hospital route map. Outside emergency number 911 and local ambulance should be relied on for response to medical emergencies and transport to emergency rooms. Due to traffic congestion that is prevalent in the New York metropolitan area, alternate hospital routes will need to be considered. The Emergency Coordinator will determine the appropriate route based on time of day and traffic patterns. Changes in the referenced primary facilities shall be documented with the CHASP Field Change Authorization Request Form (Attachment B).

The Emergency Phone Numbers listed are preliminary. Upon mobilization, the HSO shall verify all numbers and document the changes in the Site Logbook. Any changes shall also be documented with the CHASP Field Change Authorization Request Form.

Hospital route maps will be provided to all field personnel.

9.4 Pre-Emergency Planning

Langan will communicate directly with administrative personnel from the emergency room at the hospital in order to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

9.5 Emergency Medical Treatment

The procedures and rules in this CHASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the HSO on site immediately. First-aid equipment will be available on site at the following locations:

First Aid Kit:	Vehicles
Emergency Eye Wash:	Vehicles

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

Personnel with current first aid and CPR certification will be identified.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance.

Nearest hospital: **Emergency Room at The Brooklyn Hospital Center**
121 Dekalb Avenue
Brooklyn, NY 11201
(718) 250-8000
(directions from site to hospital found on Figure 2)

9.6 Non-Emergency Medical Treatment

In case of injury to personnel, which is not a medical emergency the employee will contact WorkCare at (1-888-449-7787). WorkCare provides access 24 hours / 7 days a week to experienced occupational health nurses and physicians who confer with employees at the onset of a work-related injury or illness. WorkCare will provide over the phone injury treatment or direct employees to medical treatment by third party provider, if appropriate.

9.7 Emergency Site Evacuation Routes and Procedures

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs as a result of the site redevelopment and remediation activities, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, the Langan Project Manager will be verbally notified immediately. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the nearest intersection to be accounted for and to receive further instructions.

9.8 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site and notification of the Langan Project Manager of the redevelopment and remediation activities. Portable fire extinguishers will be provided at the work zone. The extinguishers located in the various locations should also be identified prior to the start of work. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

9.8.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.

- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities.

The person responsible for the control of fuel source hazards and the maintenance of fire prevention and/or control equipment is the HSO.

9.9 Significant Vapor Release

Based on the proposed tasks, the potential for a significant vapor release is low. However, if a release occurs, the following steps will be taken:

- Move all personnel to an upwind location. All non-essential personnel shall evacuate.
- Upgrade to Level C Respiratory Protection.
- Downwind perimeter locations shall be monitored for volatile organics.
- If the release poses a potential threat to human health or the environment in the community, the Emergency Coordinator shall notify the Langan Project Manager.
- Local emergency response coordinators will be notified.

9.10 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Safety Data Sheet (SDS) will be followed, when necessary.

SKIN AND EYE: Use copious amounts of soap and water from eye-wash kits and portable hand wash stations.

CONTACT: Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Skin shall also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs. Affected items of clothing shall also be removed from contact with skin.

Providing wash water and soap will be the responsibility of each individual contractor or subcontractor on-site.

9.11 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The HSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

9.12 Incident Reporting

Once first aid and/or emergency response needs have been met, the following parties are to be contacted:

- WorkCare (1-888-449-7787)
- Langan Incident/Injury Report Hotline (973-560-4699)
- Langan Project Manager, Jessica Friscia (973-560-4488)
- Langan Health and Safety Manager, Tony Moffa (215-491-6500)
- The employer of any injured worker who is not a Langan employee

For emergencies involving personal injury and/or exposure including near-misses, the HSO or designee will complete and submit an Incident Report form (Attachment H) within 24 hours. If the employee involved is not a Langan employee, his employer shall receive a copy of the report.

9.13 Adverse Weather Conditions

In the event of adverse weather conditions, the HSO will determine if work will continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds).
- Limited visibility (fog).
- Potential for electrical storms.
- Earthquakes.
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The HSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

9.14 Spill Control and Response

All small spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the SDS will be consulted to assist in determining proper waste characterization and the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill.

All contractor vehicles shall have spill kits on them with enough material to contain and absorb the worst-case spill from that vehicle. All vehicles and equipment shall be inspected prior to be admitted on site. Any vehicle or piece

of equipment that develops a leak will be taken out of service and removed from the job site.

The following seven steps shall be taken by the Emergency Coordinator:

1. Determine the nature, identity and amounts of major spills.
2. Make sure all unnecessary persons are removed from the spill area.
3. Notify the HSO immediately.
4. Use proper PPE in consultation with the HSO.
5. If a flammable liquid, gas, or vapor is involved, remove all ignition sources and use non-sparking and/or explosion-proof equipment to contain or clean up the spill (diesel-only vehicles, air-operated pumps, etc.)
6. If possible, try to stop the leak with appropriate material.
7. Remove all surrounding materials that can react or compound with the spill.

In addition to the spill control and response procedures described in this CHASP, Langan personnel will coordinate with the designated project manager relative to spill response and control actions. Notification to the Project Manager must be immediate and, to the extent possible, include the following information:

- Time and location of the spill.
- Type and nature of the material spilled.
- Amount spilled.
- Whether the spill has affected or has a potential to affect a waterway or sewer.
- A brief description of affected areas/equipment.
- Whether the spill has been contained.
- Expected time of cleanup completion. If spill cleanup cannot be handled by Langan's on-site personnel alone, such fact must be conveyed to the Project Manager immediately.

Langan shall not make any notification of spills to outside agencies. The client will notify regulatory agencies as per their reporting procedures.

9.15 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on site:

- Industrial first aid kit.
- Fire extinguishers (one per site).

9.16 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers.
- Refilling medical supplies.
- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.

10.0 TRAINING

10.1 General Health and Safety Training

Completion of an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training program (or its equivalent) as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees who will perform work in areas where the potential for a toxic exposure exists. Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment.

10.2 Site-Specific Training

Prior to commencement of site activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include a documented verbal review of the entire CHASP and all the provisions within the CHASP document. Should any new employees arrive on-site, they

will also be given a documented full CHASP review – or one that address the appropriate tasks that remain at the time of the new employee's arrival.

10.3 Onsite Safety Briefings

Project personnel and visitors will participate in documented daily on-site health and safety briefings ("Tailgate Talks") led by the HSO to assist site personnel in safely conducting their work activities. The briefings will include information on operations to be conducted that shift, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity for the work crews to be updated on monitoring results. Prior to starting any new activity, a training session will be held for crew members involved in the activity. The Safety Briefing form (Attachment A) can be used to facilitate this effort.

10.4 Hazard Communication

All material brought on-site will be in the appropriate containers and will be properly labeled. The SDS for unleaded gasoline, diesel fuel, and hydraulic fluid are attached. Langan's written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by Langan's H&S Department.

11.0 RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping.

11.1 Field Change Authorization Request

A field change authorization request is to be completed for requesting a change to this CHASP (Attachment B). Any changes to the work to be performed that is not included in the CHASP will require an Addendum that is approved by the Langan Project Manager and Langan HSM to be prepared. Approved changes will be reviewed with all field personnel at a safety briefing.

11.2 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training, documentation of three-day OJT, and respirator fit-test records) and medical clearance for Site work and respirator use will be maintained in the office and available upon request. Records for all subcontractor employees must also be available upon request. All employee medical records will be maintained by Langan's H&S Department.

11.3 Onsite Log

A log of personnel on site each day will be kept by the HSO or designee.

11.4 Daily Safety Meetings ("Tailgate Talks")

Completed Safety Briefing forms will be maintained by the HSO.

11.5 Exposure Records

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the HSO during site work. At the end of the project, they will be maintained according to 29 CFR 1910.1020.

11.6 Hazard Communication Program/SDS

Safety Data Sheets (SDS) have been obtained for applicable substances and are included in this CHASP (Attachment I). Langan's written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by Langan's H&S Department.

11.7 Documentation

Employees are required to contact WorkCare at (1-888-449-7787) to document incidents/injuries which are not medical emergencies. Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at (973-560-4699) and the client representative to report the incident or near miss. A written report must be completed and submitted to the client representative within 24 hours of the incident. For emergencies involving personnel injury

and/or exposure, employee will complete and submit the Langan Incident/Injury Report to the Langan Corporate Health and Safety Manager as soon as possible following the incident. Accidents will be investigated in-depth to identify all causes and to recommend hazard control measures.

12.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have been verbally given a full CHASP review by Langan personnel and understand the provisions of this EHS Plan. It is maintained on site by the HSO as a project record.

Each field team member shall sign this section after Site-specific training is completed and before being permitted to work onsite.

Name (Print and Sign)	***Company***	***Date***

TABLES

TABLE 1
CONTAMINANTS OF CONCERN
130 SAINT FELIX STREET
BROOKLYN, NEW YORK

Contaminant of Concern	Affected Media
VOLATILES	
Trichloroethene (TCE)	Soil Vapor/Groundwater
SEMI-VOLATILES	
Benzo(a)anthracene	Soil/Groundwater
Benzo(a)pyrene	Soil/Groundwater
Benzo(b)fluoranthene	Soil/Groundwater
Benzo(k)fluoranthene	Soil/Groundwater
Bis(2-ethylhexyl) phthalate	Groundwater
Chrysene	Soil/Groundwater
Dibenz(a,h)anthracene	Soil
Indeno(1,2,3-cd)pyrene	Soil/Groundwater
METALS	
Iron	Groundwater
Chromium	Groundwater
Lead	Soil/Groundwater
Manganese	Groundwater
Mercury	Soil
Nickel	Soil
Sodium	Groundwater
Zinc	Soil
Pesticides	
4,4'-DDT	Soil
Per and Polyfluoroalkyl Substances	
Perfluorooctanesulfonic Acid (PFOS)	Groundwater
Perfluorooctanoic Acid (PFOA)	Soil/Groundwater
Polychlorinated Biphenyls	
Total PCBs	Groundwater

\\langan.com\data\PAR\data3\100842301\Project Data_Discipline\Environmental\Reports\2022-06 - CHASP\Tables\HASP TABLE 1 - Contaminants of Concern.doc

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
130 SAINT FELIX STREET
BROOKLYN, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Trichloroethene	100 ppm	1,000 ppm	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
Benzo(a)anthracene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Benzo(b)fluoranthene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Benzo(k)fluoranthene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Benzo(a)pyrene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Chrysene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Dibenzo(a,h)anthracene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Indeno (1,2,3-cd) pyrene	0.2 mg/m^3	80 mg/m^3	Inhalation, Skin Absorption, Ingestion	Irritate eyes, skin, upper respiratory system, cough
Lead	0.05 mg/m^3	100 mg/m^3	Inhalation, Ingestion, Skin and/or Eye Contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension
Total Chromium	5 mg/m^3	250 mg/m^3	Inhalation, Ingestion, Skin and/or Eye Contact	Irritation eyes, skin; lung fibrosis (histologic)

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
130 SAINT FELIX STREET
BROOKLYN, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Mercury	0.1 mg/m3	10 mg/m3	Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria
Copper	1 mg/m3	100 mg/m3	Inhalation, Ingestion, skin and/or eye contact	Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen]
Nickel	1 mg/m3	10 mg/m3	Inhalation, Skin Absorption, Ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria
Iron	5 mg/m3	2500 mg/m^3	Inhalation	Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)
Manganese	10 mg/m3	500 mg/m^3	Inhalation, Ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage

TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
130 SAINT FELIX STREET
BROOKLYN, NEW YORK

Chemical	Permissible Exposure Limit	IDLH Limit	Exposure Routes	Exposure Symptoms
Sodium		10 mg/m^3	Inhalation, Ingestion, skin and/or eye contact	Eyes, skin, respiratory system
Zinc		500 mg/m^3	Inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function
4,4'-DDT		500 mg/m^3	Inhalation, Ingestion, skin and/or eye contact	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]
Total PCBs		5 mg/m^3	Inhalation, Ingestion, skin and/or eye contact	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]

--- No exposure limits listed in the NIOSH Pocket Guide to Chemical Hazards dated November 2010.

TABLE 3
HAZARD ANALYSIS
130 Saint Felix Street
Brooklyn, New York

Task	Potential Risk	Description	Control Measure
1, 2	Lifting equipment	Improper lifting/carrying of equipment and materials	Follow safe lifting and general material handling
1, 2	Noise	Loud sounds caused by the machines during drilling, or excavation	Wear proper PPE (hearing protection)
1, 2	Working near heavy machinery	Close proximity to drill rig and/or construction equipment	Be aware of surroundings, wear safety vest and hard hat
1, 2	Slips, trips, and falls	Any number of injuries from slips, trips, and falls in carrying out these tasks	Good housekeeping at site, constant awareness and focus on the task
1, 2	Inhalation of Dust	Breathing in visible dust from earthwork using drills or excavators	Wear proper PPE, monitor air for dust concentrations, use dust suppression techniques
1, 2	Inhalation of Volatiles	Breathing in volatiles from earthwork using drills or excavators causing dust	Wear proper PPE, monitor air for volatile concentrations, use dust suppression techniques
1, 2	Utilities	Hitting utility lines during drilling and or excavating	Use proper mark out of underground utilities before beginning earthwork
1, 2	Skin contact with contaminated material	Material falls on skin; gets in eye	Wear proper PPE; follow safe work practices
1, 2	Ingestion of contaminated material	Material falls on skin; gets into mouth	Wear proper PPE; follow safe work practices
1, 2	Skin and eye contact with contaminated material	Material falls on skin; gets in eye	Wear proper PPE; follow safe work practices
1, 2	Heat Stress	Stress or exhaustion related to high temperatures	Hydrate and rest as needed
1, 2	Cold Stress	Stress or exhaustion related to low temperatures; hypothermia	Wear proper PPE; follow safe work practices
1, 2	Bites and stings	Bee stings, ticks, snake bites	Wear proper PPE, be watchful, follow safe work practices
1, 2	Lacerations and abrasions	Many opportunities working with hand tools	Inspect equipment being used for sharp edges, wear proper PPE; follow safe work practices

TABLE 4
INSTRUMENTATION ACTION LEVELS
130 Saint Felix Street
Brooklyn, New York

Instrument	Action Level	Level of Protection / Action Required
PID	Background to 5 ppm	Level D/No respirator; no further action required
	> 5 ppm for > 5 minutes	1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action. 2. If PID readings remain above 5 ppm, temporarily discontinue work and upgrade to Level C protection. 3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted
	> 5 ppm but < 150 ppm for > 5 minutes	Level C/ 1. Discontinue all work; all workers shall move to an area upwind of the jobsite. 2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm. 3. Level C protection will continue to be used until PID readings fall below 1 ppm.
	> 30 ppm (steady state condition) within AOC zone	Stop Work / Suppress Emissions / Evacuate and re-evaluate.
	> 150 ppm	Evacuate the work area

Total Dust Aerosol Monitor	> 0.100 mg/m above BKD (steady state condition) at perimeter of AOC zone for 15-minutes or visible dust.	Stop Work / Implement dust control / Continue dust monitoring if dust levels are less than 150 mg/m3
	< 0.150 mg/m3 above BKD (following dust suppression measures)	Stop Work / implement dust control, continue work once levels are <150 mg/m3
	>5 mg/m3	Level C

Notes:

1. 1 ppm level based on OSHA Permissible Exposure Limit (PEL) for benzene.
2. 5 ppm level based on OSHA Short Term Exposure Limit (STEL) maximum exposure for vinyl chloride for any 15-minute period.
3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene

TABLE 5
PERSONAL PROTECTIVE EQUIPMENT
130 Saint Felix Street
Brooklyn, New York

Respiratory Protection*:*

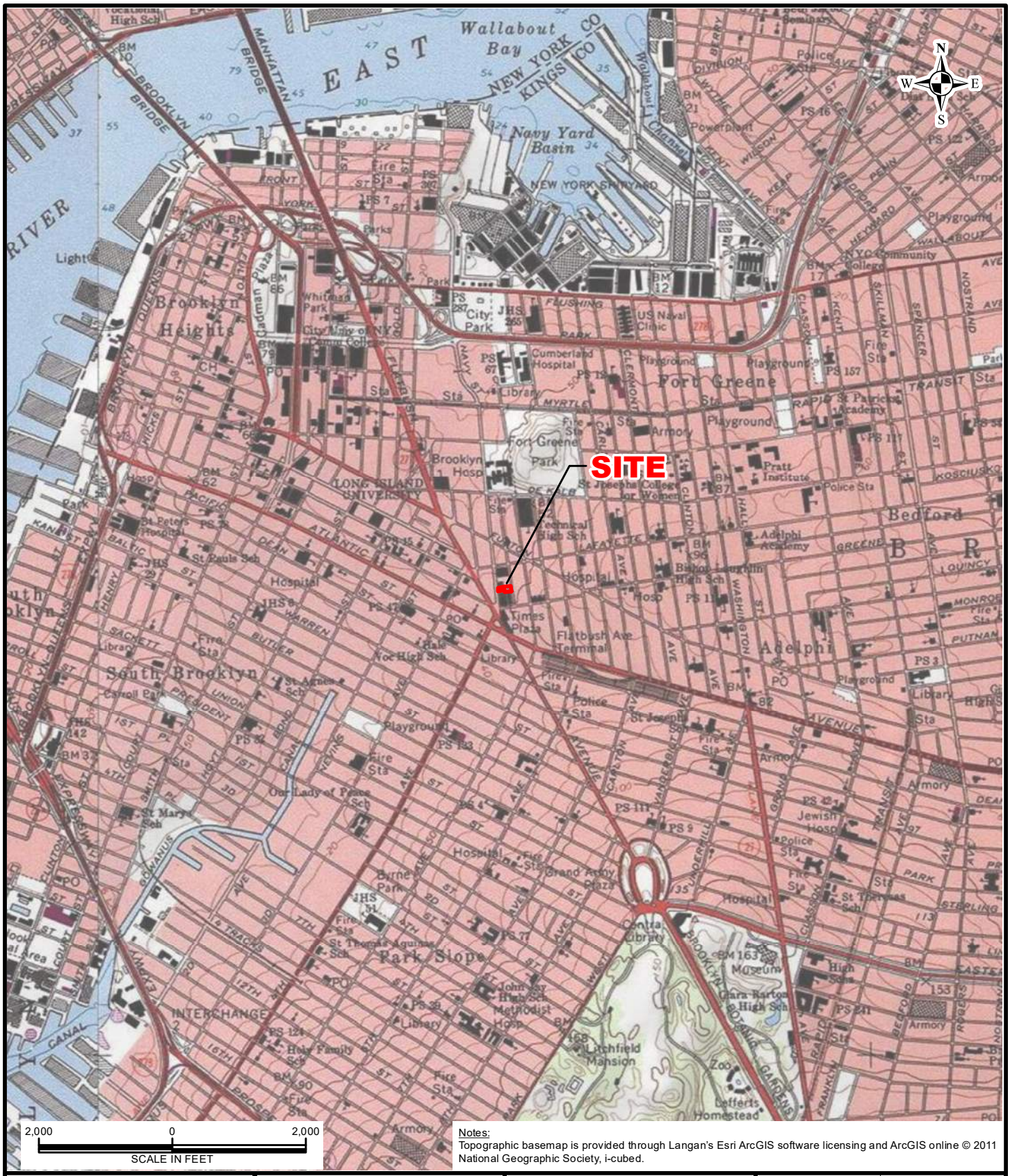
Level D:	No respirator required.
Level C:	Half-face, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols) and organic vapor cartridges. The respirator will be NIOSH-approved.
Level C - supplemental by task	Fullface, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols), acid gas, organic vapor cartridges. The respirator will be NIOSH-approved.

Personal Protective Clothing*:*

Level D:	Hard-hat, traffic vest (if working on or adjacent to the roadway), long sleeve work shirt & work pants of natural fibers, safety glasses or goggles, steel-toed boots, hearing protection (if needed), nitril inner gloves and leather outer gloves.
Level D - supplemental PPE by task	Tyvek disposal suit
Level C:	Chemically resistant outer boots and Chemical resistant Tyvek disposal suite.

\\LANGAN.COM\DATA\PAR\DATA3\100842301\PROJECT DATA_DISCIPLINE\ENVIRONMENTAL\REPORTS\2022-06 - CHASP\TABLES\HASP TABLE 5 - PPE.DOC

FIGURES



Notes:
Topographic basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online © 2011 National Geographic Society, i-cubed.

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Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

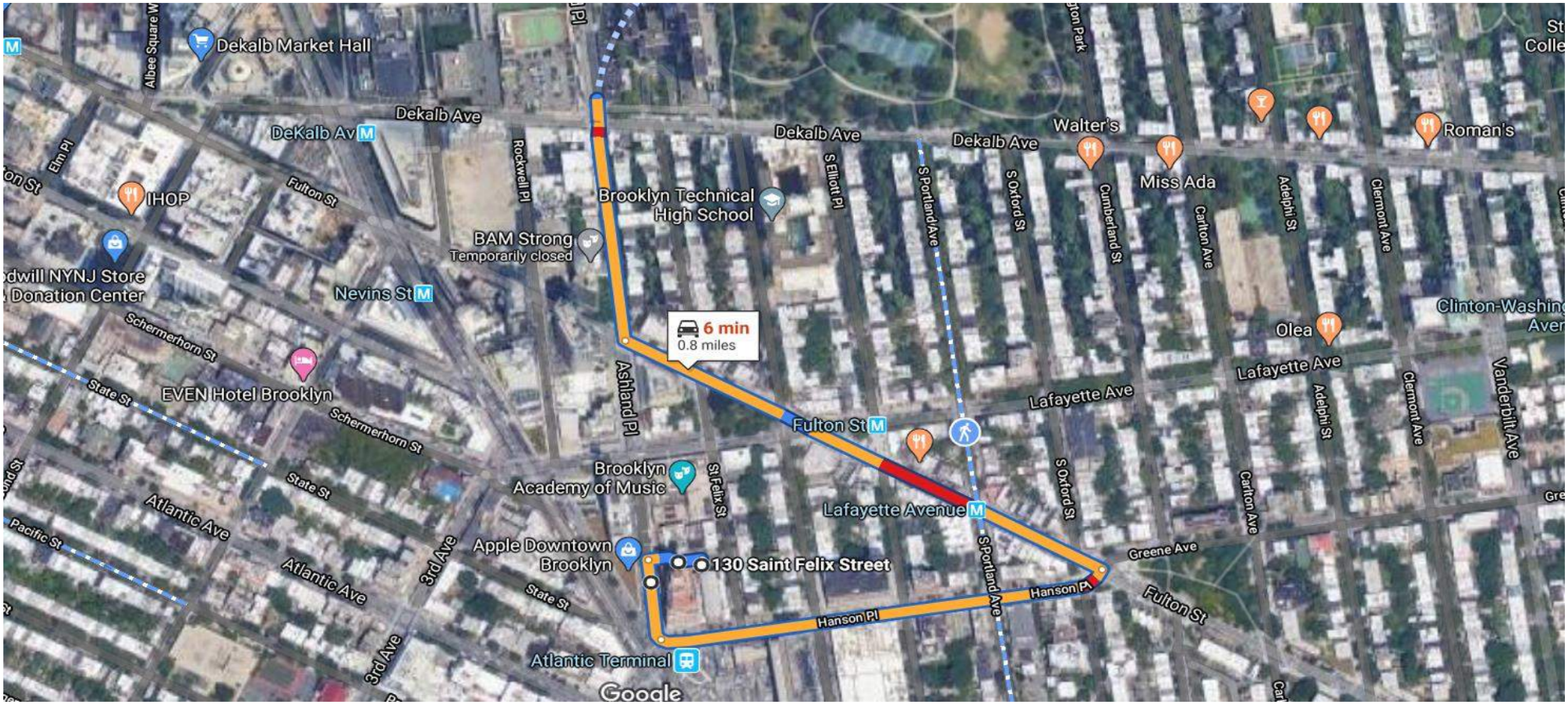
Project
130 SAINT FELIX STREET
BLOCK No. 2111, LOT No. 40
BROOKLYN NEW YORK

Drawing Title
SITE LOCATION MAP

Project No.	100842301
Date	7/30/2020
Scale	1"=2,000'
Drawn By	ATR
Figure	1

© 2013 Langan

Path: \\langan.com\data\PAR\data3\100842301\Project Data\ArcGIS\MXD\Environmental_Figures\2020-07 - RIWP\Figure 1 - Site Location Map.mxd Date: 7/30/2020 User: aruane Time: 1:07:04 PM



Emergency Route to The Brooklyn Hospital Center Emergency Room (Phone # (718) 250-8000) :

1 Start traveling west towards Ashland Place
2 Turn left onto Ashland
3 Ashland Place turns left and becomes Hanson place
4 Turn left onto Fulton St
5 Turn right onto Ashland Place, The hospital will be on your right

MAP REFERENCE: Google Maps

LANGAN

Project

130 Saint Felix Street
EMERGENGY HOSPITAL ROUTE MAP

Brooklyn **New York**

Project	DATE	SCALE	FIGURE NO.
100842301	**7/24/2020**	**NTS**	**2**

ATTACHMENT A

Health and Safety Briefing Statement

ATTACHMENT A

HEALTH AND SAFETY BRIEFING STATEMENT

The following personnel were present at a pre-job safety briefing conducted at _____(time) on _____ (date) at _____(location), and have read this Health and Safety Plan for the above Site and are familiar with its provisions:

Name	Signature
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Fully charged ABC class fire extinguisher available on Site? _____
Fully stocked First Aid Kit available on Site? _____
All project personnel advised of location of nearest phone? _____
All project personnel advised of location of designated medical facility? _____

_____
Name of Field Team Leader or Site Safety Officer

_____
Signature Date

ATTACHMENT B

Field Procedures Change Authorization Form

ATTACHMENT B

FIELD PROCEDURES CHANGE AUTHORIZATION FORM

Section to be changed:_____

Duration of Authorization Requested Date:_____

_____ Today only

_____ Duration of Task

_____ Other_____

_____

_____

Description of Procedures Modification:

_____

_____

_____

Justification:

_____ _____

Person Requesting Change Verbal Authorization Received From:

_____ _____

Name Name Time

_____ _____

Title Title

_____

Signature

Approvals:

_____

_____

_____

ATTACHMENT C

Unsafe Conditions and Practices Form

ATTACHMENT C

UNSAFE CONDITIONS AND PRACTICES FORM

DESCRIPTION OF CIRCUMSTANCES REGARDING UNSAFE CONDITION OR PRACTICE:

_____

_____

_____

_____

_____

_____

_____

IS THIS CONDITION EXISTING OR POTENTIAL?_____

REPORTED TO: _____

REPORTED BY:_____

DATE REPORTED:_____

COMMENTS:_____

_____

_____

ATTACHMENT D

Calibration Log

ATTACHMENT D

PROJECT:_____

DATE:_____

CALIBRATION LOG

Time	Inst Type	Inst #	Media	Initial Reading	Span #	Calib Reading	Performed By:

ATTACHMENT E

NYSDEC DER-10 CAMP

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50° C (14 to 122° F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

ATTACHMENT F

CAMP Special Requirements

Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure(s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m^3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m^3 or less at the monitoring point.

- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

Special Requirements for Indoor Work With Co-Located Residences or Facilities

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.

ATTACHMENT G

Emergency Notification Numbers

ATTACHMENT G

EMERGENCY NOTIFICATION NUMBERS

The following list provides names and telephone numbers for emergency contact personnel.

ORGANIZATION	CONTACT	TELEPHONE
New York City Police		911
New York City Fire		911
The Brooklyn Hospital Center		718-250-8000
WorkCare (Non-Emergency Medical Treatment)		1-888-449-7787
Langan Incident/Injury Hotline		973-560-4699
Langan Project Manager	Chris McMahon	201-218-2339
CHEMTREC	(US) (worldwide)	800-262-8200 703-741-5500
TSCA HOTLINE		202-554-1404
RCRA HOTLINE		800-424-9346
CDC	 (regional poison control)	800-232-4636 800-222-1222
BUREAU OF ALCOHOL, TOBACCO & FIREARMS	 (local)	800-800-3855 202-648-7777
NATIONAL RESPONSE CENTER		800-424-8802
PESTICIDE INFORMATION SERVICE		800-858-7378
BUREAU OF EXPLOSIVES, A.A. RAILWAYS	 (Support Services)	202-639-2265 719-584-7151
FEDERAL EXPRESS - HAZARDOUS MATERIAL INFO		800-463-3339 *call and say 'Hazardous Materials'
New York State Department of Health		1-866-881-2809
New York State Department of Environmental Conservation		1-844-332-3267
NYSDEC Spill Hotline		1-800-457-7362

ATTACHMENT H

Accident / Incident Report Form

ATTACHMENT H

INCIDENT REPORT

LANGAN EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT
(Submit a Separate Report for Each Employee and/or Incident)

Date: _____

Employee's Name:_____ Employee No:_____

Sex: M _____ F _____ Age: _____

Region: _____ Location:_____

Project: _____ Project No: _____

Incident:_____

Type: Possible Exposure _____ Exposure _____ Physical Injury _____

Location: _____

Date of Incident: _____ Time of Incident: _____

Date of Report Incident: _____

Person(s) to Whom Incident was Reported: _____

Weather Conditions During Incident: Temperature _____ Humidity _____

Wind Speed and Direction: _____ Cloud Cover: _____

Clear: _____ Precipitation: _____

Materials Potentially Encountered: _____

Chemical (give name of description - liquid, solid, gas, vapor, fume, mist):

_____

_____

Radiological:_____

Other: _____

Nature of the Exposure/Injury: (State the nature of the exposure/injury in detail and list the parts of the body affected. Attach extra sheets if necessary).

_____

_____

_____

_____

_____

Did you receive medical care? Yes _____ No _____ If so, when _____

Where? On-Site _____ Off-Site _____

By Whom: Name of Paramedic: _____

Name of Physician: _____

Other: _____

If Off-Site, name facility (hospital, clinic, etc):_____

_____

Length of stay at the facility?_____

Was the Site Safety Officer contacted? Yes _____ No _____ When?_____

Was the Corporate Health and Safety Officer contacted? Yes _____ No _____

If so, who was the contact?_____

Did the exposure/injury result in permanent disability? Yes _____ No _____

If so, explain:_____

_____

_____

_____

Has the employee returned to work? Yes _____ No _____

List the names of other persons affected during this incident:

_____

_____

_____

_____

_____

_____

_____

List the names of persons who witnessed the exposure/injury incident:

_____
_____
_____
_____
_____
_____
_____

Possible cause of the exposure/injury incident: _____

_____
_____
_____
_____
_____

What was the name and title of the field team leader or immediate supervisor at the site of the incident?

_____

Was the operation being conducted under an established Health and Safety Plan?

Yes _____ No _____ If yes, attach a copy. If no, explain

_____
_____
_____
_____
_____
_____

Describe protective equipment and clothing used by the employee:

_____
_____
_____
_____
_____
_____

Did any limitations in safety equipment or protective clothing contribute to or affect exposure? If so, explain:

_____
_____
_____

What was the employee doing when the exposure/injury occurred? (Describe briefly as Site Reconnaissance, Site Characterization, or Sampling, etc.):

_____

_____

_____

_____

Where exactly on site or off site did the exposure/injury occur?

_____

_____

_____

_____

_____

How did the exposure/injury occur? (Describe fully what factors led up to and/or contributed to the incident):

_____

_____

_____

_____

_____

Name of person(s) initiating report, job title, phone number:

_____

_____

_____

_____ _____

Employee Signature Date

_____ _____

Site Safety Officer Signature or Field Team Leader Signature Date

ATTACHMENT I

Safety Data Sheets
(SDS)

LANGAN

SAFETY DATA SHEET

Version 6.3
Revision Date 02/07/2023
Print Date 10/21/2023

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : 4,4′-DDD

Product Number : 35486
Brand : Sigma-Aldrich
CAS-No. : 72-54-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 4), H312
Carcinogenicity (Category 2), H351
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal Word Danger

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Hazard statement(s)

H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane TDE
Formula	:	$C_{14}H_{10}Cl_4$
Molecular weight	:	320.04 g/mol
CAS-No.	:	72-54-8
EC-No.	:	200-783-0

Component	Classification	Concentration
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H400, H410 M-Factor - Aquatic Acute: 100 - Aquatic Chronic: 100	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Hydrogen chloride gas
Nature of decomposition products not known.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid inhalation of dusts. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

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For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

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Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	94.0 - 96.0 °C (201.2 - 204.8 °F)
f)	Initial boiling point and boiling range	193.0 °C 379.4 °F at 1.3 hPa
g)	Flash point	No data available
h)	Evaporation rate	No data available

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i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	< 0.000 hPa at 25.0 °C (77.0 °F)
l)	Vapor density	No data available
m)	Density	1.38 g/cm3
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 6.02
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 113 mg/kg
(Calculation method)
LD50 Oral - Rat - 113.0 mg/kg
Remarks: (RTECS)
Inhalation: No data available
Acute toxicity estimate Dermal - 1,200 mg/kg
(Calculation method)
LD50 Dermal - Rabbit - 1,200 mg/kg
Remarks: Behavioral:Excitement.
Behavioral:Convulsions or effect on seizure threshold.
Skin irritation
(RTECS)

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
Suspected of causing cancer.

IARC:	2A - Group 2A: Probably carcinogenic to humans (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
IARC:	2A - Group 2A: Probably carcinogenic to humans (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
ACGIH:	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
	No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.
	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

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Aspiration hazard
No data available

11.2 Additional Information

RTECS: KI0700000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Reportable Quantity (RQ): 1 lbs

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Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant : yes

IATA
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

SECTION 15: Regulatory information

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-02-16

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-02-16

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-02-16

New Jersey Right To Know Components

	CAS-No.	Revision Date
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	1993-02-16

California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	2007-09-28

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in		

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the State of California to cause cancer.2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane	72-54-8	2007-09-28

SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.3 Revision Date: 02/07/2023 Print Date: 10/21/2023

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Safety Data Sheet

1,1-Dichloro-2,2-bis(4-chlorophenyl-d_4)ethylene

Section 1. Chemical product and company identifications

Product code: D-3005
Chemical formula: $C_{14}D_8Cl_4$
CAS: 93952-19-3
CAS (unlabelled): 72-55-9
Synonyms: 4,4'-DDE, 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene

Supplier / Manufacturer:

C/D/N Isotopes Inc.
88 Leacock Street
Pointe-Claire (Québec) H9R 1H1
Phone: 514-697-6254
Toll-Free (Canada & USA): 1-800-565-4696
Fax: 514-697-6148
Website: www.cdnisotopes.com

In case of emergency:

TOXYSCAN HOTLINE: 1-855-780-0599

Section 2. Hazards identifications

Physical state: Solid
Warning: Harmful if swallowed. Suspected of causing cancer.
Routes of entry: Inhalation, skin and eyes

GHS (Globally Harmonized System of Classification and Labelling of Chemicals):

GHS Classification:
- Acute toxicity, Oral (Category 4)
- Carcinogenicity (Category 2)

GHS Label elements:
- Pictograms:
- Signal word: Warning

Hazards statement:
- H302 Harmful if swallowed.
- H351 Suspected of causing cancer.

Precautionary statement: - P281 Use personal protective equipment as required.

Section 3. Composition and information on ingredients

Name	CAS	Concentration %
1,1-Dichloro-2,2-bis(4-chlorophenyl-d_4)ethylene	93952-19-3	> 98

Section 4. First aid measures

Eye contact: Flush eyes with water as a precaution.
Skin contact: Wash off with soap and plenty of water. Consult a physician.
Inhalation: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
Ingestion: Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
General advice: Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

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Section 5. Firefighting measures

Flammability of the product: Not flammable or combustible.
Lower explosion limit: No data available.
Upper explosion limit: No data available.
Auto-ignition temperature: No data available.
Flash point: No data available.
Products of combustion: Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
Firefighting media and instructions: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Special protective equipment for firefighters: Wear self-contained breathing apparatus for firefighting if necessary.

Section 6. Accidental release measures

Personal precautions: Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
Environmental precautions: Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
Methods for cleaning up: Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

Section 7. Handling and storage

Handling: Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.
Storage: Store at room temperature. Adequate ventilation. Protect from light.

Section 8. Exposure Controls, Personal Protections

Engineering controls: Use mechanical exhaust or laboratory fumehood to avoid exposure.
Eyes: Safety glasses with side-shields conforming to NIOSH (US).
Respiratory: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US).
Hands: Handle with gloves. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
Skin/body: Impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Section 9. Physical and chemical properties (unlabelled)

Molecular weight: 318.03 g/mol
Physical status: Solid
Color: White-pale yellow
Odour: No data available
Density: No data available
Melting point: 88 - 90 °C (190 - 194 °F)
Boiling point: 336 °C (637 °F)
Vapour pressure: < 0.00001 hPa (< 0.00001 mmHg)
Vapour density: No data available
Partition coefficient (octanol/water): log Pow: 6.51
Water solubility: 0.04 mg/L

Section 10. Stability and reactivity

Stability and reactivity: Stable under recommended storage conditions.
Incompatibility: Strong oxidizing agents, strong bases.
Products of combustion: Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
Reactivity conditions: No data available.

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Section 11. Toxicological information (unlabelled)

Toxicological data: 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene

Information on ingredients:

Name	CAS	LD_{50}	LC_{50}
1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene	72-55-9	Oral - rat - 880 mg/kg	No data available

Potential acute effects

- **Eyes:** May cause eye irritation.
- **Skin:** Harmful if absorbed through skin. May cause skin irritation.
- **Inhalation:** May be harmful if inhaled. May cause respiratory tract irritation.
- **Ingestion:** Harmful if swallowed.

Potential chronic effects

- **Carcinogenic effects:** This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification. Limited evidence of carcinogenicity in animal studies. IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC. ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
- **Mutagenic effects:** No data available.
- **Teratogenic effects:** No data available.
- **Medical conditions aggravated by overexposure:** No data available.

Section 12. Ecological information

Ecological data:

Name	Results	Species	Period
1,1-Dichloro-2,2-bis (4-chlorophenyl)ethylene	0.2 - 0.3 mg/l LC50	Lepomis macrochirus	96 h
	0.03 - 0.04 mg/l LC50	Oncorhynchus mykiss	96 h
	0.05 - 0.18 mg/l LC50	Salmo salar	96 h

Effects on environment: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Mobility: No data available.
Environmental precautions: No data available.
Persistence and degradability: No data available.
Bioaccumulative potential: Gambusia affinis (Mosquito fish) - 33 d. Bioconcentration factor (BCF): 12,037.

Section 13. Disposal considerations

Waste disposal: Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Section 14. Transportation information

Classification DOT/IMDG/IATA label:

Shipping name: Not dangerous goods
UN number: None
Class: None
Packaging group: None

Additional information: None

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Section 15. Regulatory information

UNITED STATES:
NFPA classification

Health: 1
Flammable: 0
Reactivity: 0
Specials conditions: None

Legend: 4: Severe, 3: High, 2: Moderate, 1: Slightly, 0: Not hazardous

U.S. Federal regulations:

TSCA 8(b) inventory: 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene
SARA 302/304/311/312 extremely hazardous substances: Not Listed
SARA 302/304 emergency planning and notification: Not Listed
SARA 302/304/311/312 hazardous chemicals: Not Listed
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard: Not Listed
CWA (Clean Water Act) 307: Not Listed
CWA (Clean Water Act) 311: Not Listed
CAA (Clean Air Act) 112 accidental release prevention: Not Listed
CAA (Clean Air Act) 112 regulated flammable substances: Not Listed
CAA (Clean Air Act) 112 regulated toxic substances: Not Listed

State regulations:

DEA List I Chemicals (Precursor Chemicals): Not Listed
DEA List II Chemicals (Essential Chemicals): Not Listed
Substances in Massachusetts: Not Listed
Dangerous substances in New Jersey: Not Listed
New York – Dangerous substances with acute effects: Not Listed
Dangerous substances in Pennsylvania – right to know: Not Listed

WHMIS (Canada):

Not WHMIS controlled.

Section 16. Additional information

References:

- ANSI Z400.1, MSDS Standard, 2001.
- Manufacturer's Material Safety Data Sheet.
- 29CFR Part1910.1200 OSHA MSDS Requirements.
- 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG. -Canada
- Gazette Part II, Vol. 122, No. 2 Registration SOR/88-64 31 December, 1987 Hazardous Products Act "Ingredient Disclosure List".
- Federal act on the controlled products
- Canadian Transport of Dangerous Goods, Regulations and Schedules, Clear Language version 2002.
- Toxicological repertory, HSC.
- Material safety data sheet from the components.

Date of issue: **February 20th, 2017**
Version: 1
Elaborated by: **Toxyscan Inc., 1-866-780-0599**
Notice to reader: To the best of our knowledge, the information contained herein is accurate. However, C/D/N Isotopes Inc., Toxyscan Inc., or any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

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Safety Data Sheet

Revision Date: 12/23/16
www.restek.com

1. IDENTIFICATION

Catalog Number / Product Name:	**32203 / 4,4'-DDT Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	8
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1
Flammable Liquid Category 2
Acute Toxicity - Inhalation Dust / Mist Category 3
Acute Toxicity - Dermal Category 3
Acute Toxicity - Oral Category 3

GHS Signal Word:
Danger

GHS Hazard:
Highly flammable liquid and vapour.
Toxic if swallowed, in contact with skin or if inhaled.
Causes damage to organs.

GHS Precautions:

Safety Precautions:
Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilation and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe dust/fume/gas/mist/vapours/spray.
Wash hands and skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.

First Aid Measures:
IF SWALLOWED: Immediately call a POISON CENTER/doctor/....
IF ON SKIN: Wash with plenty of soap and water.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF exposed: Call a POISON CENTER or doctor/physician.
Call a POISON CENTER or doctor/physician.
Call a POISON CENTER or doctor/physician if you feel unwell.
Specific treatment see section 4.
Rinse mouth.
Take off immediately all contaminated clothing and wash it before reuse.
In case of fire: Use extinguishing media in section 5 for extinction.

Storage: Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: No data available.

Repeated Exposure Target Organs: No data available.

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
methanol	67-56-1	200-659-6	99.900000
4,4'-DDT	50-29-3	200-024-3	0.100000

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

Fire and/or Explosion Hazards: Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions:	Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
Storage Technical Measures and Conditions:	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
methanol	67-56-1	6000 ppm IDLH	250 ppm STEL	200 ppm TWA	200 ppm TWA; 260 mg/m3 TWA
4,4'-DDT	50-29-3	500 mg/m3 IDLH		1 mg/m3 TWA	1 mg/m3 TWA (listed under Dichlorodiphenyltric hloroethane)

Personal Protection:

Engineering Measures:	Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.
Respiratory Protection:	Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	No data available.
Odor:	Mild
Physical State:	No data available.
pH:	No data available.
Vapor Pressure:	No data available.
Vapor Density:	1.1 (air = 1)
Boiling Point:	No data available.
Melting Point:	-98 °C
Flash Point:	52
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	36
Lower Flammable/Explosive Limit, % in air:	6
Autoignition Temperature:	464 deg C
Decomposition Temperature:	No data available.
Specific Gravity:	0.791 - 0.792 g/cm3 at 20 °C
Evaporation Rate:	No data available.
Odor Threshold:	No data available.
Solubility:	Moderate; 50-99%
Partition Coefficient: n-octanol in water:	No data available.
VOC % by weight:	99.9
Molecular Weight:	32.04

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	No data available.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure:	Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity:	Harmful! Can cause systemic damage (see "Target Organs)Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness.
Skin Contact:	Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Eye Contact:	Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue.
Ingestion Irritation:	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.Highly toxic and may be fatal if swallowed.
Ingestion Toxicity:	Toxic if swallowed. May cause target organ failure and/or death.May be fatal if swallowed.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	Contains a probable or known human carcinogen.
Reproductive and Developmental Toxicity:	Contains a known human reproductive and/or developmental hazard.
Inhalation:	Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs)
Skin Contact:	Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Ingestion:	Toxic if swallowed. May cause target organ failure and/or death.

Component Toxicological Data:
NIOSH:

Chemical Name	**CAS No.**	**LD50/LC50**
Methanol	67-56-1	Inhalation LC50 Rat 22500 ppm 8 h
DDT	50-29-3	Dermal LD50 Rabbit 300 - 2820 mg/kg

Component Carcinogenic Data:
OSHA:

Chemical Name	**CAS No.**	
DDT	50-29-3	Present

ACGIH:

Chemical Name	**CAS No.**	
DDT	50-29-3	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

NIOSH:

Chemical Name	**CAS No.**	
DDT	50-29-3	potential occupational carcinogen

NTP:

Chemical Name	**CAS No.**
No data available.	

IARC:

Chemical Name	**CAS No.**	**Group No.**
No data.		Group 1
DDT	50-29-3	Group 2A
No data.		Group 2B

12. ECOLOGICAL INFORMATION

Overview:	Moderate ecological hazard. This product may be dangerous

to plants and/or wildlife.

Mobility: No data
Persistence: No data
Bioaccumulation: No data
Degradability: Biodegrades slowly.
Ecological Toxicity Data: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.
Disposal Methods: Dispose of by incineration following Federal, State, Local, or Provincial regulations.
Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:
DOT Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3
Packing Group: II

International:
IATA Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3(6.1)
Packing Group: II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available.			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
methanol	67-56-1	X	X	-	X
4,4'-DDT	50-29-3	X	-	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
DDT	50-29-3	Prop 65 Cancer
Methanol	67-56-1	Prop 65 Devolop Tox
p,p"-DDT	50-29-3	Prop 65 Devolop Tox
p,p"-DDT	50-29-3	Prop 65 Rep Female
p,p"-DDT	50-29-3	Prop 65 Rep Male

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
methanol	67-56-1	X	X	X	X
4,4'-DDT	50-29-3	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 09/30/14
Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
References: No data available.
Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose

prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding prodcuts described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

SAFETY DATA SHEET

Version 4.7
Revision Date 05/23/2016
Print Date 06/23/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Arsenic
Product Number	:	202657
Brand	:	Aldrich
Index-No.	:	033-001-00-X
CAS-No.	:	7440-38-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 3), H331
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H302	Harmful if swallowed.
H331	Toxic if inhaled.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.

P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	As
Molecular weight	:	74.92 g/mol
CAS-No.	:	7440-38-2
EC-No.	:	231-148-6
Index-No.	:	033-001-00-X

Hazardous components

Component	Classification	Concentration
Arsenic		
	Acute Tox. 4; Acute Tox. 3; Aquatic Acute 1; Aquatic Chronic 1; H302, H331, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Arsenic	7440-38-2	TWA	0.01 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Lung cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen		
		C	0.0020 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A 15 minute ceiling value		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Arsenic	7440-38-2	inorganic arsenic plus methylated metabolites	35µg As/l	In urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of the workweek (After four or five consecutive working days			

		with exposure)			
		inorganic arsenic plus methylated metabolites	35µg As/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of the workweek (After four or five consecutive working days with exposure)			

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Pieces Colour: grey
b)	Odour	No data available
c)	Odour Threshold	No data available

d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 817 °C (1,503 °F) - lit.
f)	Initial boiling point and boiling range	613 °C (1,135 °F) - lit.
g)	Flash point	Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	5.727 g/mL at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat Exposure to air may affect product quality.

10.5 Incompatible materials
Oxidizing agents, Halogens, Palladium undergoes a violent reaction with arsenic, Zinc, Platinum oxide, Nitrogen trichloride, Bromine azide

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Arsenic oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 763 mg/kg
Remarks: Behavioral:Ataxia. Diarrhoea

LD50 Oral - Mouse - 145 mg/kg
Remarks: Behavioral:Ataxia. Diarrhoea

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

IARC:	1 - Group 1: Carcinogenic to humans (Arsenic)
NTP:	Known to be human carcinogen (Arsenic)
	Known to be human carcinogen (Arsenic)
OSHA:	OSHA specifically regulated carcinogen (Arsenic)

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: CG0525000

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 9.9 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 3.8 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic
Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1558 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: ARSENIC
Marine pollutant:yes

IATA
UN number: 1558 Class: 6.1 Packing group: II
Proper shipping name: Arsenic

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Arsenic	7440-38-2	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Arsenic	7440-38-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Arsenic	7440-38-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Arsenic	7440-38-2	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Arsenic	7440-38-2	2008-10-10

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H302	Harmful if swallowed.
H331	Toxic if inhaled.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7 Revision Date: 05/23/2016 Print Date: 06/23/2016

SAFETY DATA SHEET

Version 5.6
Revision Date 06/02/2016
Print Date 07/20/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Benz[*a*]anthracene
Product Number	:	48563
Brand	:	Supelco
Index-No.	:	601-033-00-9
CAS-No.	:	56-55-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	+1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P391	Collect spillage.

P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	1,2-Benzanthracene Tetraphene
Formula	:	$C_{18}H_{12}$
Molecular weight	:	228.29 g/mol
CAS-No.	:	56-55-3
EC-No.	:	200-280-6
Index-No.	:	601-033-00-9

Hazardous components

Component	Classification	Concentration
Benz[a]anthracene		
	Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber

Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 157 - 159 °C (315 - 318 °F)
f)	Initial boiling point and boiling range	437.6 °C (819.7 °F)
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available

t) Oxidizing properties No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 mg/kg

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)

NTP: Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)

NTP: Reasonably anticipated to be a human carcinogen (Benz[a]anthracene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benz[a]anthracene)
Marine pollutant:yes
IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benz[a]anthracene	56-55-3	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene	56-55-3	2007-09-28
WARNING! This product contains a chemical known to the State of California to cause cancer. Benz[a]anthracene	56-55-3	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6 Revision Date: 06/02/2016 Print Date: 07/20/2017

SAFETY DATA SHEET

Revision Date 22-May-2017 **Revision Number** 2

1. Identification

Product Name **Benzo[a]pyrene, 98%**

Cat No. : **AC105600010; AC105601000**

Synonyms Benzo[def]chrysene.; 3,4-Benzopyrene; 3,4-Benzpyrene

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Sensitization	Category 1
Germ Cell Mutagenicity	Category 1A
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 1A

Label Elements

Signal Word
Danger

Hazard Statements
May cause an allergic skin reaction
May cause genetic defects
May cause cancer
May damage fertility or the unborn child

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Avoid breathing dust/fume/gas/mist/vapors/spray
Contaminated work clothing should not be allowed out of the workplace
Wear protective gloves
Response
IF exposed or concerned: Get medical attention/advice
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation or rash occurs: Get medical advice/attention
Wash contaminated clothing before reuse
Storage
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Benzo[a]pyrene	50-32-8	> 96

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes.

Inhalation Move to fresh air.

Ingestion Do not induce vomiting.

Most important symptoms/effects May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
None known
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up No information available.

7. Handling and storage

Handling Ensure adequate ventilation.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Benzo[a]pyrene		TWA: 0.2 mg/m³		

Legend

OSHA - Occupational Safety and Health Administration

Engineering Measures Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Dark yellow
Odor	aromatic
Odor Threshold	No information available
pH	
Melting Point/Range	175 179 °C
Boiling Point/Range	°C @ 760 mmHg

Flash Point	
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	No information available
Specific Gravity	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C20H12
Molecular Weight	252.31

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products None under normal use conditions

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Benzo[a]pyrene	50-32-8	Group 1	Reasonably Anticipated	A2	X	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Endocrine Disruptor Information No information available

Component	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Benzo[a]pyrene	Group III Chemical	Not applicable	Not applicable

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains.

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

Component	log Pow
Benzo[a]pyrene	6.06

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Benzo[a]pyrene - 50-32-8	U022	-

14. Transport information

DOT

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

TDG

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

IATA

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

IMDG/IMO

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Benzo[a]pyrene	X	X	-	200-028-5	-		X	-	-	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Benzo[a]pyrene	50-32-8	> 96	0.1

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Benzo[a]pyrene	-	-	X	X

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Benzo[a]pyrene	1 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Benzo[a]pyrene	50-32-8	Carcinogen	0.06 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Benzo[a]pyrene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N

DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade	No information available

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Revision Date	22-May-2017
Print Date	22-May-2017
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Revision Date 10-Feb-2015 **Revision Number** 1

1. Identification

Product Name **Barium**

Cat No. : **AC317860000; AC317860250; AC317861000; AC317865000**

Synonyms None Known.

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids	Category 2
Acute oral toxicity	Category 3
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
Toxic if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Response
Call a POISON CENTER or doctor/physician if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Fire
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
Storage
Store locked up
Store in a closed container
Store in a well-ventilated place. Keep cool
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Barium	7440-39-3	99.9

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms/effects No information available.
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Dry chemical.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Contact with water liberates toxic gas. Water reactive. Combustible material. Produce flammable gases on contact with water.

Hazardous Combustion Products
None known
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	W

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions See Section 12 for additional ecological information.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal.

7. Handling and storage

Handling Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Handle under inert gas, protect from moisture. Wear personal protective equipment.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Protect from moisture. Never allow product to get in contact with water during storage. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Barium	TWA: 0.5 mg/m^3	(Vacated) TWA: 0.5 mg/m^3	

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Barium			TWA: 0.5 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration

Engineering Measures Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	Grey
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	725 °C / 1337 °F
Boiling Point/Range	1640 °C / 2984 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	10 mmHg @ 1094 °C
Vapor Density	No information available
Relative Density	3.51 @ 20 °C
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Ba
Molecular Weight	137.34

10. Stability and reactivity

Reactive Hazard Yes

Stability Moisture sensitive. Air sensitive.

Conditions to Avoid Exposure to air. Incompatible products. Exposure to moisture.

Incompatible Materials Acids, Water, Alcohols, Halogens

Hazardous Decomposition Products None under normal use conditions

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Oral LD50 Category 3. ATE = 50 - 300 mg/kg.
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Barium	132 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Barium	7440-39-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available
Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Persistence and Degradability No information available
Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1400
Proper Shipping Name	BARIUM
Hazard Class	4.3
Packing Group	II

TDG

UN-No	UN1400
Proper Shipping Name	BARIUM
Hazard Class	4.3
Packing Group	II

IATA

UN-No	UN1400
Proper Shipping Name	Barium
Hazard Class	4.3
Packing Group	II

IMDG/IMO

UN-No	UN1400
Proper Shipping Name	Barium
Hazard Class	4.3
Packing Group	II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Barium	X	X	-	231-149-1	-		X	-	X	X	X

Legend:
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Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Barium	7440-39-3	99.9	1.0

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

Clean Water Act Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Barium	1000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Barium	X	X	X	-	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class B4 Flammable solid
B6 Reactive flammable material
D2B Toxic materials
D1A Very toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 10-Feb-2015
Print Date 10-Feb-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

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transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

Safety Data Sheet

Revision Date: 12/08/16
www.restek.com

1. IDENTIFICATION

Catalog Number / Product Name:	**31272 / Benzo(b)fluoranthene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	9
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Flammable Liquid Category 2 Serious Eye Damage/Eye Irritation Category 2 Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3
GHS Signal Word:	Danger
GHS Hazard:	Highly flammable liquid and vapour. Causes serious eye irritation. May cause drowsiness or dizziness.
GHS Precautions:	
Safety Precautions:	Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilation and lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/mist/vapours/spray. Wash hands and skin thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a POISON CENTER or doctor/physician if you feel unwell. If eye irritation persists: Get medical advice/attention. In case of fire: Use extinguishing media in section 5 for extinction.
Storage:	Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store locked up.
Disposal:	Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: No data available.

Repeated Exposure Target Organs: No data available.

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Acetone	67-64-1	200-662-2	99.900000
benzo (b) fluoranthene	205-99-2	205-911-9	0.100000

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Fire and/or Explosion Hazards: Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

Storage Technical Measures and Conditions: Store in a cool dry ventilated location. Isolate from

incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Acetone	67-64-1	2500 ppm IDLH (10% LEL)	500 ppm STEL 750 ppm STEL; 1782 mg/m3 STEL	250 ppm TWA 500 ppm TWA; 1188 mg/m3 TWA	1000 ppm TWA; 2400 mg/m3 TWA
benzo (b) fluoranthene	205-99-2	ND		No TLV	No data available.

Personal Protection:

Engineering Measures: Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

Respiratory Protection: No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.

Eye Protection: Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

Skin Protection: Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

Medical Conditions Aggravated By Exposure: Respiratory disease including asthma and bronchitis

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	Depends upon product selection
Odor:	Strong
Physical State:	No data available.
pH:	No data available.
Vapor Pressure:	No data available.
Vapor Density:	2.0 (air = 1)
Boiling Point:	No data available.
Melting Point:	-95.4 °C Melting Point
Flash Point:	39
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	No data available.
Lower Flammable/Explosive Limit, % in air:	No data available.
Autoignition Temperature:	465 deg C
Decomposition Temperature:	No data available.
Specific Gravity:	0.7845 g/cm3 at 25 °C
Evaporation Rate:	No data available.
Odor Threshold:	ND
Solubility:	Complete; 100%
Partition Coefficient: n-octanol in water:	No data available.
VOC % by weight:	0
Molecular Weight:	58.08

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	No data available.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents Strong acids
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure:	Eyes, Central nervous system stimulation, Respiratory Tract, Skin
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.
Skin Contact:	Can cause minor skin irritation, defatting, and dermatitis.
Eye Contact:	Can cause minor irritation, tearing and reddening.
Ingestion Irritation:	May be harmful if swallowed.
Ingestion Toxicity:	Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	Contains a probable or known human carcinogen.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Inhalation:	Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.
Skin Contact:	Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis.

Component Toxicological Data:
NIOSH:

Chemical Name	CAS No.	LD50/LC50
Acetone	67-64-1	Dermal LD50 Rabbit >15700 mg/kg; Oral LD50 Rat 5800 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h

Component Carcinogenic Data:
OSHA:

Chemical Name	CAS No.	
Benzo(b)fluoranthene	205-99-2	Present

ACGIH:

Chemical Name	CAS No.	
Acetone	67-64-1	A4 - Not Classifiable as a Human Carcinogen
Benzo[b]fluoranthene	205-99-2	A2 - Suspected Human Carcinogen

NIOSH:

Chemical Name	CAS No.
No data available.	

NTP:

Chemical Name	CAS No.
No data available.	

IARC:

Chemical Name	CAS No.	Group No.
No data.		Group 1
No data.		Group 2A
Benzo(b)fluoranthene	205-99-2	Group 2B

12. ECOLOGICAL INFORMATION

Overview:	This material is not expected to be harmful to the ecology.
Mobility:	No data
Persistence:	No data
Bioaccumulation:	No data
Degradability:	No data
Ecological Toxicity Data:	No data available.

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product:	Spent or discarded material is a hazardous waste.
Disposal Methods:	Dispose of by incineration following Federal, State, Local, or Provincial regulations.
Waste Disposal of Packaging:	Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name:	Acetone

UN Number:	UN1090
Hazard Class:	3
Packing Group:	II

International:

IATA Proper Shipping Name:	Acetone
UN Number:	UN1090
Hazard Class:	3
Packing Group:	II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available.			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Acetone	67-64-1	X	-	-	X
benzo (b) fluoranthene	205-99-2	X	X	-	-

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Benzo[b]fluoranthene	205-99-2	Prop 65 Cancer

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Acetone	67-64-1	X	X	X	X
benzo (b) fluoranthene	205-99-2	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 03/23/15

Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available.

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1 Identification

Product identifier

Product name: **Benzene**

Stock number: L14012
CAS Number:
71-43-2
EC number:
200-753-7
Index number:
601-020-00-8
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

GHS02 Flame

Flam. Liq. 2 H225 Highly flammable liquid and vapor.

GHS08 Health hazard

Muta. 1B H340 May cause genetic defects.
Carc. 1A H350 May cause cancer.
STOT RE 1 H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
Asp. Tox. 1 H304 May be fatal if swallowed and enters airways.

GHS07

Skin Irrit. 2 H315 Causes skin irritation.
Eye Irrit. 2 H319 Causes serious eye irritation.
Hazards not otherwise classified No information known.

Label elements
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS02 GHS07 GHS08

Signal word Danger
Hazard statements
H225 Highly flammable liquid and vapor.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
H304 May be fatal if swallowed and enters airways.
Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification
B2 - Flammable liquid
D2A - Very toxic material causing other toxic effects

Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 2
Flammability = 3
Physical Hazard = 1

(Contd. on page 2)

Product name: **Benzene**

(Contd. of page 1)

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
71-43-2 Benzene
Identification number(s):
EC number: 200-753-7
Index number: 601-020-00-8

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.
Information for doctor
Most important symptoms and effects, both acute and delayed No further relevant information available.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources
Environmental precautions: Do not allow product to reach sewage system or any water course.
Methods and material for containment and cleaning up:
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose of contaminated material as waste according to section 13.
Ensure adequate ventilation.
Prevention of secondary hazards: Keep away from ignition sources.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Open and handle container with care.
Information about protection against explosions and fires:
Protect against electrostatic charges.
Fumes can combine with air to form an explosive mixture.
Keep ignition sources away.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: Store in a cool location.
Information about storage in one common storage facility:
Do not store together with acids.
Store away from strong bases.
Store away from oxidizing agents.
Store away from halogens.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

(Contd. on page 3)

Product name: Benzene

(Contd. of page 2)

Control parameters

Components with limit values that require monitoring at the workplace:

71-43-2 Benzene (100.0%)

PEL (USA)	Short-term value: 15* mg/m³, 5* ppm Long-term value: 3* mg/m³, 1* ppm *table Z-2 for exclusions in 29CFR1910.1028(d)
REL (USA)	Short-term value: 1 ppm Long-term value: 0.1 ppm See Pocket Guide App. A
TLV (USA)	Short-term value: 8 mg/m³, 2.5 ppm Long-term value: 1.6 mg/m³, 0.5 ppm Skin; BEI
EL (Canada)	Short-term value: 2.5 ppm Long-term value: 0.5 ppm Skin; ACGIH A1; IARC 1
EV (Canada)	Short-term value: 2.5 ppm Long-term value: 0.5 ppm Skin

Ingredients with biological limit values:

71-43-2 Benzene (100.0%)

BEI (USA)	25 µg/g creatinine Medium: urine Time: end of shift Parameter Parameter: S-Phenylmercapturic acid (background 500 µg/g creatinine Medium: urine Time: end of shift Parameter: t,t-Muconic acid (background)

Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Recommended filter device for short term use:
Use a respirator with organic vapor/acid gas cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards such as NIOSH (USA) or CEN (EU).
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Material of gloves Fluorocarbon rubber (Viton)
Penetration time of glove material (in minutes) Not determined
Eye protection: Safety glasses
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information

Appearance:	
Form:	Liquid
Color:	Colorless
Odor:	Aromatic
Odor threshold:	Not determined.
pH-value:	Not determined.
Change in condition	
Melting point/Melting range:	5 °C (41 °F)
Boiling point/Boiling range:	80 °C (176 °F)
Sublimation temperature / start:	Not determined
Flash point:	-11 °C (12 °F)
Flammability (solid, gaseous)	Not determined.
Ignition temperature:	555 °C (1031 °F)
Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Product is not explosive. However, formation of explosive air/vapor mixtures is possible.
Explosion limits:	
Lower:	1.2 Vol %
Upper:	8 Vol %
Vapor pressure at 20 °C (68 °F):	101 hPa (76 mm Hg)
Density at 20 °C (68 °F):	0.874 g/cm³ (7.294 lbs/gal)
Relative density	Not determined.
Vapor density	Not determined.
Evaporation rate	Not determined.
Solubility in / Miscibility with	
Water at 25 °C (77 °F):	1.8 g/l
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic at 20 °C (68 °F):	0.66 mPas
kinematic:	Not determined.

(Contd. on page 4)

Product name: **Benzene**

(Contd. of page 3)

Other information No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials:
Acids
Oxidizing agents
Bases
Halogens
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.

LD/LC50 values that are relevant for classification:

Oral	LD50	930 mg/kg (rat)
Dermal	LD50	>9400 µL/kg (rabbit)
Inhalative	LC50/7H	10000 ppm/7H (rat)

Skin irritation or corrosion: Causes skin irritation.
Eye irritation or corrosion: Causes serious eye irritation.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity:
May cause genetic defects.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
Carcinogenicity:
May cause cancer.
EPA-A: human carcinogen: sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer.
IARC-1: Carcinogenic to humans: sufficient evidence of carcinogenicity.
ACGIH A1: Confirmed human carcinogen: Agent is carcinogenic to humans based on epidemiologic studies of, or convincing clinical evidence in, exposed humans.
EPA-K: Known human carcinogens.
Carcinogen as defined by OSHA.
NTP-K: Known to be carcinogenic: sufficient evidence from human studies.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
Reproductive toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive data for this substance.
Specific target organ system toxicity - repeated exposure:
Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: May be fatal if swallowed and enters airways.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes:
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number	
DOT, IMDG, IATA	UN1114
UN proper shipping name	
DOT	RQ Benzene
IMDG, IATA	BENZENE
Transport hazard class(es)	
DOT	

Class	3 Flammable liquids.
Label	3
Class	3 (F1) Flammable liquids

(Contd. on page 5)

Product name: **Benzene**

(Contd. of page 4)

Label	3
IMDG, IATA	
Class	3 Flammable liquids.
Label	3
Packing group	
DOT, IMDG, IATA	II
Environmental hazards:	Not applicable.
Special precautions for user	Warning: Flammable liquids
EMS Number:	F-E,S-D
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT	
Hazardous substance:	10 lbs, 4.54 kg
Marine Pollutant (DOT):	No
UN "Model Regulation":	UN1114, Benzene, 3, II

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS02 GHS07 GHS08

Signal word Danger
Hazard statements
H225 Highly flammable liquid and vapor.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
H304 May be fatal if swallowed and enters airways.
Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings)
71-43-2 Benzene

California Proposition 65

Prop 65 - Chemicals known to cause cancer
71-43-2 Benzene

Prop 65 - Developmental toxicity
71-43-2 Benzene

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male
71-43-2 Benzene

Information about limitation of use:
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.
For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative

(Contd. on page 6)

Product name: Benzene

(Contd. of page 5)

ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

SAFETY DATA SHEET

Version 4.6
Revision Date 12/29/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Beryllium
Product Number	:	378135
Brand	:	Aldrich
CAS-No.	:	7440-41-7

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 2), H330
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Specific target organ toxicity - repeated exposure (Category 1), H372

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H301	Toxic if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.

H372	Causes damage to organs through prolonged or repeated exposure.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician. Rinse mouth.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Be
Molecular weight	:	9.01 g/mol
CAS-No.	:	7440-41-7
EC-No.	:	231-150-7

Hazardous components

Component	Classification	Concentration
Berylium foil		
	Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT SE 3; STOT RE 1; H301, H315, H317, H319, H330, H335, H350, H372	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Beryllium oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Berylium foil	7440-41-7	TWA	2.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	25.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	2.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z27.29-1970		
		CEIL	5.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization Chronic beryllium disease (berylliosis) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	2.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25.000000microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		TWA	0.000050 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Beryllium sensitization		

		Chronic beryllium disease (berylliosis) Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Confirmed human carcinogen Danger of cutaneous absorption Sensitizer		
		C	0.000500 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	2microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		CEIL	5microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		Peak	25microgram per cubic meter	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z27.29-1970		
		C	0.0005 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: grey
b)	Odour	odourless
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 1,278 °C (2,332 °F) - lit.
f)	Initial boiling point and boiling range	2,970 °C (5,378 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.85 g/cm3 at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Alkali metals

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - 0.496 mg/kg
Remarks: Liver:Hepatitis (hepatocellular necrosis), zonal.

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Hamster
Lungs
Result: negative

Carcinogenicity

Carcinogenicity - Rat - Intratracheal
Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Carcinogenicity - Rabbit - Intravenous
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Possible human carcinogen

IARC:	1 - Group 1: Carcinogenic to humans (Berylium foil)
NTP:	Known to be human carcinogen (Berylium foil)
	Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Berylium foil)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: DS1750000

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium, powder
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1567 Class: 6.1 (4.1) Packing group: II EMS-No: F-G, S-G
Proper shipping name: BERYLLIUM POWDER

IATA
UN number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium powder

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Berylium foil	7440-41-7	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Berylium foil	7440-41-7	2008-10-10

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H301	Toxic if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitisation

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	3
Reactivity Hazard:	3

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Safety Data Sheet

Revision Date: 12/30/16
www.restek.com

1. IDENTIFICATION

Catalog Number / Product Name:	**31274 / Benzo(k)fluoranthene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	10
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Flammable Liquid Category 2 Serious Eye Damage/Eye Irritation Category 2 Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3
GHS Signal Word:	Danger
GHS Hazard:	Highly flammable liquid and vapour. Causes serious eye irritation. May cause drowsiness or dizziness.
GHS Precautions:	
Safety Precautions:	Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilation and lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/mist/vapours/spray. Wash hands and skin thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a POISON CENTER or doctor/physician if you feel unwell. If eye irritation persists: Get medical advice/attention. In case of fire: Use extinguishing media in section 5 for extinction.
Storage:	Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store locked up.
Disposal:	Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: No data available.

Repeated Exposure Target Organs: No data available.

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Acetone	67-64-1	200-662-2	99.900000
benzo (k) fluoranthene	207-08-9	205-916-6	0.100000

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Fire and/or Explosion Hazards: Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

Storage Technical Measures and Conditions: Store in a cool dry ventilated location. Isolate from

incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Acetone	67-64-1	2500 ppm IDLH (10% LEL)	500 ppm STEL 750 ppm STEL; 1782 mg/m3 STEL	250 ppm TWA 500 ppm TWA; 1188 mg/m3 TWA	1000 ppm TWA; 2400 mg/m3 TWA
benzo (k) fluoranthene	207-08-9	ND		No TLV	No data available.

Personal Protection:

Engineering Measures: Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

Respiratory Protection: No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.

Eye Protection: Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

Skin Protection: Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

Medical Conditions Aggravated By Exposure: Respiratory disease including asthma and bronchitis

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	Depends upon product selection
Odor:	Strong
Physical State:	No data available.
pH:	No data available.
Vapor Pressure:	No data available.
Vapor Density:	2.0 (air = 1)
Boiling Point:	No data available.
Melting Point:	-95.4 °C Melting Point
Flash Point:	39
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	No data available.
Lower Flammable/Explosive Limit, % in air:	No data available.
Autoignition Temperature:	465 deg C
Decomposition Temperature:	No data available.
Specific Gravity:	0.7845 g/cm3 at 25 °C
Evaporation Rate:	No data available.
Odor Threshold:	ND
Solubility:	Complete; 100%
Partition Coefficient: n-octanol in water:	No data available.
VOC % by weight:	0
Molecular Weight:	58.08

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	No data available.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents Strong acids
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure:	Eyes, Central nervous system stimulation, Respiratory Tract, Skin
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.
Skin Contact:	Can cause minor skin irritation, defatting, and dermatitis.
Eye Contact:	Can cause minor irritation, tearing and reddening.
Ingestion Irritation:	May be harmful if swallowed.
Ingestion Toxicity:	Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	Contains a probable or known human carcinogen.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Inhalation:	Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.
Skin Contact:	Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis.

Component Toxicological Data:
NIOSH:

Chemical Name	**CAS No.**	**LD50/LC50**
Acetone	67-64-1	Dermal LD50 Rabbit >15700 mg/kg; Oral LD50 Rat 5800 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h

Component Carcinogenic Data:
OSHA:

Chemical Name	**CAS No.**	
Benzo(k)fluoranthene	207-08-9	Present

ACGIH:

Chemical Name	**CAS No.**	
Acetone	67-64-1	A4 - Not Classifiable as a Human Carcinogen

NIOSH:

Chemical Name	**CAS No.**
No data available.	

NTP:

Chemical Name	**CAS No.**
No data available.	

IARC:

Chemical Name	**CAS No.**	**Group No.**
No data.		Group 1
No data.		Group 2A
Benzo(k)fluoranthene	207-08-9	Group 2B

12. ECOLOGICAL INFORMATION

Overview:	This material is not expected to be harmful to the ecology.
Mobility:	No data
Persistence:	No data
Bioaccumulation:	No data
Degradability:	No data
Ecological Toxicity Data:	No data available.

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product:	Spent or discarded material is a hazardous waste.
Disposal Methods:	Dispose of by incineration following Federal, State, Local, or Provincial regulations.
Waste Disposal of Packaging:	Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:	
DOT Proper Shipping Name:	Acetone
UN Number:	UN1090

Hazard Class: 3
Packing Group: II

International:
IATA Proper Shipping Name: Acetone
UN Number: UN1090
Hazard Class: 3
Packing Group: II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available.			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Acetone	67-64-1	X	-	-	X
benzo (k) fluoranthene	207-08-9	X	X	-	-

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Benzo[k]fluoranthene	207-08-9	Prop 65 Cancer

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Acetone	67-64-1	X	X	X	X
benzo (k) fluoranthene	207-08-9	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 05/15/15
Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
References: No data available.
Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding prodcuts described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

SAFETY DATA SHEET

Creation Date 14-May-2010 **Revision Date** 23-Dec-2014 **Revision Number** 1

1. Identification

Product Name **Carbazole**

Cat No. : **AC108260000; AC108260010; AC108260050; AC108260250; AC108262500; AC108265000**

Synonyms 9-Azafluorene; Dibenzopyrrole; Diphenylenimine

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 1B
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause cancer

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
9H-Carbazole	86-74-8	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Obtain medical attention.

Inhalation Remove from exposure, lie down. Move to fresh air. Obtain medical attention.

Ingestion Clean mouth with water. Get medical attention.

Most important symptoms/effects No information available.
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point 220 °C / 428 °F
Method - No information available

Autoignition Temperature 540 °C / 1004 °F
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Nitrogen oxides (NOx) Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	1	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Do not let this chemical enter the environment.

7. Handling and storage

Handling Avoid contact with skin and eyes. Do not breathe dust. Do not ingest. Use only in area provided with appropriate exhaust ventilation.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	Beige
Odor	pungent
Odor Threshold	No information available
pH	No information available
Melting Point/Range	240 - 246 °C / 464 - 474.8 °F
Boiling Point/Range	355 °C / 671 °F @ 760 mmHg
Flash Point	220 °C / 428 °F
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	400 mmHg @ 323 °C
Vapor Density	Not applicable
Relative Density	1.1
Solubility	insoluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	540 °C / 1004 °F
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C12 H9 N
Molecular Weight	167.21

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents, Strong bases

Hazardous Decomposition Products Nitrogen oxides (NOx), Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
9H-Carbazole	>5000 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Limited evidence of a carcinogenic effect.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
9H-Carbazole	86-74-8	Group 2B	Not listed	Not listed	X	Not listed

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available
Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
9H-Carbazole	6.7 mg/L EC50 = 60 h	1 mg/L LC50 48 h	EC50 = 10.6 mg/L 15 min EC50 = 11.6 mg/L 30 min EC50 = 13.6 mg/L 5 min	Not listed

Persistence and Degradability Insoluble in water Persistence is unlikely
Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
9H-Carbazole	3.84

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT
UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s.
Proper technical name 9H-Carbazole
Hazard Class 9
Packing Group III
TDG

UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s.
Hazard Class 9
Packing Group III

IATA

UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s.
Hazard Class 9
Packing Group III

IMDG/IMO

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
9H-Carbazole	X	X	-	201-696-0	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazardous Categorization

Acute Health Hazard Yes
Chronic Health Hazard Yes
Fire Hazard No
Sudden Release of Pressure Hazard No
Reactive Hazard No

Clean Water Act Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
Not applicable

California Proposition 65 This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category

9H-Carbazole	86-74-8	Carcinogen	4.1 µg/day	Carcinogen

State Right-to-Know Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class D2A Very toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 14-May-2010
Revision Date 23-Dec-2014
Print Date 23-Dec-2014
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

SAFETY DATA SHEET

Version 5.4
Revision Date 04/21/2015
Print Date 05/13/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Chlordane - Sandy Loam 2
Product Number	:	CRM825
Brand	:	Sigma-Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), H373
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H350	May cause cancer.
H373	May cause damage to organs through prolonged or repeated exposure if inhaled.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Hazardous components

Component		Classification	Concentration
Quartz			
CAS-No. EC-No.	14808-60-7 238-878-4	Carc. 2; STOT RE 2; H351, H373	>= 90 - <= 100 %
Chlordane			
CAS-No. EC-No. Index-No.	57-74-9 200-349-0 602-047-00-8	Acute Tox. 3; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H410	< 0.1 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
silicon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Store at Room Temperature.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Quartz	14808-60-7	TWA	0.025 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Suspected human carcinogen		
		TWA	0.025 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Lung cancer Pulmonary fibrosis Suspected human carcinogen		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	1 - Group 1: Carcinogenic to humans (Quartz)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Known to be human carcinogen (Quartz)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Liver - Irregularities - Based on Human Evidence
Liver - Irregularities - Based on Human Evidence
Nerves. - (Chlordane)

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date

Quartz	14808-60-7	1994-04-01
Chlordane	57-74-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Quartz	14808-60-7	1994-04-01
Chlordane	57-74-9	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Quartz	14808-60-7	1994-04-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Chlordane	57-74-9	2007-09-28
Quartz	14808-60-7	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301 + H311	Toxic if swallowed or in contact with skin
H350	May cause cancer.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure if inhaled.
H402	Harmful to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.
STOT RE	Specific target organ toxicity - repeated exposure

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.4 Revision Date: 04/21/2015 Print Date: 05/13/2016

SAFETY DATA SHEET

Methyl Chloride (R40)

Section 1. Identification

GHS product identifier : Methyl Chloride (R40)

Chemical name : chloromethane

Other means of identification : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

Product use : Synthetic/Analytical chemistry.

Synonym : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

SDS # : 001036

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Emergency telephone number (with hours of operation) : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas
ACUTE TOXICITY (inhalation) - Category 4
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.
Harmful if inhaled.
Suspected of causing cancer.
May cause damage to organs through prolonged or repeated exposure. (central nervous system (CNS))

Precautionary statements

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Section 2. Hazards identification

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Never Put cylinders into unventilated areas of passenger vehicles. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use only outdoors or in a well-ventilated area. Do not breathe gas. Use and store only outdoors or in a well ventilated place.

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Store locked up. Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : Liquid can cause burns similar to frostbite.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : chloromethane

Other means of identification : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

CAS number/other identifiers

CAS number : 74-87-3

Product code : 001036

Ingredient name	%	CAS number
chloromethane	100	74-87-3

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

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Section 4. First aid measures

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Liquid can cause burns similar to frostbite.

Inhalation : Harmful if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Skin contact : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : Ingestion of liquid can cause burns similar to frostbite.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
frostbite

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
frostbite

Ingestion : Adverse symptoms may include the following:
frostbite

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

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Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

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Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
chloromethane	**ACGIH TLV (United States, 3/2012).** **Absorbed through skin.** TWA: 50 ppm 8 hours. TWA: 103 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 207 mg/m³ 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** TWA: 50 ppm 8 hours. TWA: 105 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 210 mg/m³ 15 minutes. **OSHA PEL Z2 (United States, 11/2006).** TWA: 100 ppm 8 hours. CEIL: 200 ppm AMP: 300 ppm 5 minutes.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

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Section 8. Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 50.49 g/mole

Molecular formula : C-H3-Cl

Boiling/condensation point : -23.7°C (-10.7°F)

Melting/freezing point : -97°C (-142.6°F)

Critical temperature : 143.65°C (290.6°F)

Odor : Mild. Sweetish.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: 10°C (50°F)

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Section 9. Physical and chemical properties

Burning time	:	Not applicable.
Burning rate	:	Not applicable.
Evaporation rate	:	Not available.
Flammability (solid, gas)	:	Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
Lower and upper explosive (flammable) limits	:	Lower: 8.1% Upper: 17.4%
Vapor pressure	:	58.7 (psig)
Vapor density	:	1.8 (Air = 1)
Specific Volume (ft ^{3}/lb)	:	1.0977
Gas Density (lb/ft ^{3})	:	0.911 (25°C / 77 to °F)
Relative density	:	Not applicable.
Solubility	:	Not available.
Solubility in water	:	5.32 g/l
Partition coefficient: n-octanol/water	:	0.91
Auto-ignition temperature	:	632°C (1169.6°F)
Decomposition temperature	:	Not available.
SADT	:	Not available.
Viscosity	:	Not applicable.

Section 10. Stability and reactivity

Reactivity	:	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow gas to accumulate in low or confined areas.
Incompatibility with various substances	:	Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.

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Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
chloromethane	LC50 Inhalation Gas.	Rat	8300 ppm	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
chloromethane	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
chloromethane	Category 2	Not determined	central nervous system (CNS)

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Liquid can cause burns similar to frostbite.

Inhalation : Harmful if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Skin contact : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

Ingestion : Ingestion of liquid can cause burns similar to frostbite.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
frostbite

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Section 11. Toxicological information

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following: frostbite

Ingestion : Adverse symptoms may include the following: frostbite

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : May cause damage to organs through prolonged or repeated exposure.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
chloromethane	Acute LC50 270000 µg/l Marine water	Fish - Menidia beryllina	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
chloromethane	0.91	-	low

Mobility in soil

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Section 12. Ecological information

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Methyl chloride (I,T); Methane, chloro- (I, T)	74-87-3	Listed	U045

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1063	UN1063	UN1063	UN1063	UN1063
UN proper shipping name	METHYL CHLORIDE, OR REFRIGERANT GAS R 40	METHYL CHLORIDE; OR REFRIGERANT GAS R 40	METHYL CHLORIDE, OR REFRIGERANT GAS R 40	METHYL CHLORIDE (REFRIGERANT GAS R 40)	METHYL CHLORIDE
Transport hazard class(es)	2.1	2.1	2.1	2.1	2.1
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Reportable quantity** 100 lbs / 45.4 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 5 kg **Cargo aircraft** Quantity limitation: 100 kg	**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 100 kg

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Section 14. Transport information

	Special provisions				
	T50				

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Water Act (CWA) 307: chloromethane

Clean Air Act (CAA) 112 regulated toxic substances: chloromethane

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
chloromethane	100	Yes.	Yes.	No.	Yes.	Yes.

SARA 313

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Section 15. Regulatory information

	Product name	CAS number	%
Form R - Reporting requirements	chloromethane	74-87-3	100
Supplier notification	chloromethane	74-87-3	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
chloromethane	No.	Yes.	No.	No.

Canada inventory : This material is listed or exempted.

International regulations

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals : Not listed

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.
Class B-6: Reactive flammable material
Class D-2A: Material causing other toxic effects (Very toxic).

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

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Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.
Class B-6: Reactive flammable material
Class D-2A: Material causing other toxic effects (Very toxic).

Hazardous Material Information System (U.S.A.)

Health	*	2
Flammability		4
Physical hazards		2

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing : 5/20/2015.

Date of issue/Date of revision : 5/20/2015.

Date of previous issue : 10/15/2014.

Version : 0.03

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act

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Section 16. Other information

(EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health
TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

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Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 13-Sep-2013 **Revision Date** 21-Jul-2015 **Revision Number** 2

1. Identification

Product Name **Chromium**

Cat No. : **C318-500**

Synonyms Chrome

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Specific target organ toxicity (single exposure) Target Organs - Respiratory system.	Category 3

Label Elements

Signal Word
Warning

Hazard Statements
May cause respiratory irritation

Precautionary Statements
Prevention
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life

3. Composition / information on ingredients

Component	CAS-No	Weight %
Chromium	7440-47-3	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

Ingestion Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects None reasonably foreseeable.
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media Carbon dioxide (CO_2)

Flash Point Not applicable
Method - No information available

Autoignition Temperature Not applicable
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Dust can form an explosive mixture in air. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Chromium oxide
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	1	1	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Avoid dust formation. Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Chromium	TWA: 0.5 mg/m^3	(Vacated) TWA: 1 mg/m^3 TWA: 1 mg/m^3	IDLH: 250 mg/m^3 TWA: 0.5 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Chromium	TWA: 0.5 mg/m^3	TWA: 0.5 mg/m^3	TWA: 0.5 mg/m^3

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	1857.2 °C / 3375 °F

Boiling Point/Range	2640 °C / 4784 °F
Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Relative Density	7.2
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cr
Molecular Weight	51.996

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Sensitive to air.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation.

Incompatible Materials Strong oxidizing agents, Strong acids

Hazardous Decomposition Products Chromium oxide

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation May cause irritation of respiratory tract

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Chromium	7440-47-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Chromium	Not listed	LC50: 14.3 mg/l/96 H (Pimephales promelas)	Not listed	EC50: 0.07 mg/l/48 H

Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.
Proper technical name Chromium
Hazard Class 9
Packing Group III

TDG Not regulated

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.
Hazard Class 9
Packing Group III

IATA

UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Packing Group III

IMDG/IMO

UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s
Hazard Class 9
Packing Group III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Chromium	X	X	-	231-157-5	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Chromium	7440-47-3	>95	1.0

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Chromium	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Chromium	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Chromium	5000 lb 10 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Chromium	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class D2B Toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 13-Sep-2013
Revision Date 21-Jul-2015
Print Date 21-Jul-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

SAFETY DATA SHEET

Version 5.3
Revision Date 03/04/2015
Print Date 05/13/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Chrysene
Product Number	:	35754
Brand	:	Sigma-Aldrich
Index-No.	:	601-048-00-0
CAS-No.	:	218-01-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H341	Suspected of causing genetic defects.
H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.

P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_{18}H_{12}$
Molecular weight	:	228.29 g/mol
CAS-No.	:	218-01-9
EC-No.	:	205-923-4
Index-No.	:	601-048-00-0

Hazardous components

Component	Classification	Concentration
Chrysene		
	Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section), see BEI® for Polycyclic Aromatic Hydrocarbons (PAHs) Exposure by all routes should be carefully controlled to levels as low as possible. Confirmed animal carcinogen with unknown relevance to humans		
Chrysene	218-01-9	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar		

		products. cyclohexane-extractable fraction See Appendix C See Appendix A

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Chrysene	218-01-9	1-Hydroxypyrene (1-HP)		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 252 - 254 °C (486 - 489 °F) - lit.
f)	Initial boiling point and boiling range	448 °C (838 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: 5.73
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - > 320 mg/kg

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Chrysene)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	OSHA specifically regulated carcinogen (Chrysene)

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: GC0700000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chrysene)
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)
Marine pollutant:yes
IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chrysene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date

Chrysene	218-01-9	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chrysene	218-01-9	1994-04-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. Chrysene	CAS-No. 218-01-9	Revision Date 2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.3 Revision Date: 03/04/2015 Print Date: 05/13/2016

SAFETY DATA SHEET

Creation Date 22-Sep-2009 **Revision Date** 10-Feb-2015 **Revision Number** 1

1. Identification

Product Name **cis-1,2-Dichloroethylene**

Cat No. : **AC113380000; AC113380025; AC113380100; AC113380500**

Synonyms cis-Acetylene dichloride.

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
Harmful if swallowed
Harmful if inhaled
Causes serious eye irritation
Causes skin irritation
May cause respiratory irritation

Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Avoid breathing dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Take precautionary measures against static discharge
Do not eat, drink or smoke when using this product
Response
Call a POISON CENTER or doctor/physician if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
Rinse mouth
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Fire
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
Storage
Store in a well-ventilated place. Keep cool
Store in a closed container
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
cis-1,2-Dichloroethylene	156-59-2	97

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

Ingestion Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects Breathing difficulties. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. Use water spray to cool unopened containers. chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point 6 °C / 42.8 °F
Method - No information available

Autoignition Temperature 440 °C / 824 °F
Explosion Limits
Upper 12.80%
Lower 9.70%
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Flammable. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products
Hydrogen chloride gas Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	3	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes and clothing.

Environmental Precautions See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Ensure adequate ventilation. Wear personal protective equipment. Use explosion-proof equipment. Use only non-sparking tools. Avoid contact with skin, eyes and clothing. Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
cis-1,2-Dichloroethylene	TWA: 200 ppm		

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
cis-1,2-Dichloroethylene			TWA: 200 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

Engineering Measures Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-80 °C / -112 °F
Boiling Point/Range	60 °C / 140 °F @ 760 mmHg
Flash Point	6 °C / 42.8 °F
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	12.80%
Lower	9.70%
Vapor Pressure	201 mmHg @ 25 °C
Vapor Density	3.34 (Air = 1.0)
Relative Density	1.280
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	440 °C / 824 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C2 H2 Cl2
Molecular Weight	96.94

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Keep away from open flames, hot surfaces and sources of ignition. Exposure to air. Exposure to light. Incompatible products. Exposure to moist air or water.

Incompatible Materials Bases

Hazardous Decomposition Products Hydrogen chloride gas, Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
cis-1,2-Dichloroethylene	156-59-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Do not empty into drains. Do not flush into surface water or sanitary sewer system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
cis-1,2-Dichloroethylene	Not listed	Not listed	EC50 = 721 mg/L 5 min EC50 = 905 mg/L 30 min	Not listed

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1150
Proper Shipping Name	1,2-DICHLOROETHYLENE
Hazard Class	3
Packing Group	II

TDG

UN-No	UN1150
Proper Shipping Name	1,2-DICHLOROETHYLENE
Hazard Class	3
Packing Group	II

IATA

UN-No	1150
Proper Shipping Name	1,2-DICHLOROETHYLENE
Hazard Class	3
Packing Group	II

IMDG/IMO

UN-No	1150
Proper Shipping Name	1,2-DICHLOROETHYLENE
Hazard Class	3
Packing Group	II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
cis-1,2-Dichloroethylene	X	-	X	205-859-7	-		-	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	Yes

Sudden Release of Pressure Hazard No
Reactive Hazard No

Clean Water Act Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA

Component	Hazardous Substances RQs	CERCLA EHS RQs
cis-1,2-Dichloroethylene	1000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
cis-1,2-Dichloroethylene	X	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class B2 Flammable liquid
D1B Toxic materials
D2B Toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 22-Sep-2009
Revision Date 10-Feb-2015
Print Date 10-Feb-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally

Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

SAFETY DATA SHEET

COPPER

Section 1. Identification

GHS product identifier	:	COPPER
Chemical name	:	Mixture
CAS number	:	Mixture
Other means of identification	:	CC01053472
Product type	:	liquid

Relevant identified uses of the substance or mixture and uses advised against

Product use	:	Industrial applications. Plastics.
Supplier's details	:	**POLYONE CORPORATION** ColorMatrix Group Inc. 680 North Rocky River Drive, Berea, Ohio, 44017-1628, USA +1 216 622 0100
Emergency telephone number (with hours of operation)	:	**CHEMTREC 1-800-424-9300 (24hrs for spill, leak, fire, exposure or accident).**

Section 2. Hazards identification

This mixture has not been evaluated as a whole for health effects. Information provided on health effects of this product is based on the individual components. However, some vapors or contaminants may be released upon heating and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respiratory protection, etc.) to protect employees from exposure. See sections 8 and 11 for special precautions. After handling, always wash hands thoroughly with soap and water.

OSHA/HCS status	:	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	:	SKIN CORROSION/IRRITATION - Category 2

GHS label elements

Hazard pictograms :

Signal word : Warning
Hazard statements : Causes skin irritation.

Precautionary statements

General : Not applicable.
Prevention : Wear protective gloves. Wash hands thoroughly after handling.
Response : IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention.
Storage : Not applicable.
Disposal : Not applicable.
Supplemental label elements : None known.
Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture
Chemical name : Mixture
Other means of identification : CC01053472

CAS number/other identifiers

Ingredient name	%	CAS number
Miscellaneous Compounds Distillates, petroleum, hydrotreated middle	10 - 30	Not available.
Titanium dioxide	5 - 10	13463-67-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	:	Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
Inhalation	:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Skin contact	:	Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	:	Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	:	Causes serious eye irritation.
Inhalation	:	No known significant effects or critical hazards.
Skin contact	:	Causes skin irritation.
Ingestion	:	Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact	:	Adverse symptoms may include the following: pain or irritation

		watering redness
Inhalation	:	No specific data.
Skin contact	:	Adverse symptoms may include the following: irritation redness
Ingestion	:	No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	:	Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	:	No specific treatment.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	:	In case of fire, use water spray (fog), foam, dry chemical or CO_2.
Unsuitable extinguishing media	:	None known.
Specific hazards arising from the chemical	:	In a fire or if heated, a pressure increase will occur and the container may burst.
Hazardous thermal decomposition products	:	Decomposition products may include the following materials: carbon dioxide carbon monoxide metal oxide/oxides
Special protective actions for fire-fighters	:	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Titanium dioxide	**OSHA PEL 1989 (1989-03-01)** PEL: Permissible Exposure Level 10 mg/m3 Form: Total dust **OSHA PEL (1993-06-30)** PEL: Permissible Exposure Level 15 mg/m3 Form: Total dust **ACGIH TLV (1996-05-18)** TLV-TWA: Threshold Limit Value - Time weighted average PEL: Permissible Exposure Level 10 mg/m3

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated

clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : liquid [liquid]
Color : BROWN
Odor : Faint odor.
Odor threshold : Not available.
pH : Not available.
Melting point : Not available.
Boiling point : Not available.
Flash point : Not available.
Burning time : Not available.

Burning rate	:	Not available.
Evaporation rate	:	Not available.
Flammability (solid, gas)	:	Not available.
Lower and upper explosive (flammable) limits	:	**Lower:** Not available. **Upper:** Not available.
Vapor pressure	:	Not available.
Vapor density	:	Not available.
Relative density	:	Not available.
Solubility	:	Not available.
Solubility in water	:	insoluble in water.
Partition coefficient: n-octanol/water	:	Not available.
Auto-ignition temperature	:	Not available.
Decomposition temperature	:	Not available.
SADT	:	Not available.
Viscosity	:	**Dynamic:** Not available. **Kinematic:** Not available.

Section 10. Stability and reactivity

Reactivity	:	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	:	Stable under recommended storage and handling conditions (see Section 7).
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	Keep away from extreme heat and oxidizing agents.
Incompatible materials	:	Keep away from strong acids. Oxidizer.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

This mixture has not been evaluated as a whole for health effects. Exposure effects listed are based on existing health data for the individual components which comprise the mixture.

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Titanium dioxide				

	LC50 Inhalation	Rat - Male	6.82 Mg/l	4 h
	LD50 Dermal	Rabbit	> 5,000 mg/kg	-

Conclusion/Summary : Mixture.Not fully tested.

Irritation/Corrosion

Conclusion/Summary
Skin : Mixture.Not fully tested.
Eyes : Mixture.Not fully tested.
Respiratory : Mixture.Not fully tested.

Sensitization

Conclusion/Summary
Skin : Mixture.Not fully tested.
Respiratory : Mixture.Not fully tested.

Mutagenicity

Conclusion/Summary : Mixture.Not fully tested.

Carcinogenicity

Conclusion/Summary : Mixture.Not fully tested.

Classification

Product/ingredient name	OSHA	IARC	NTP
Titanium dioxide		2B	

Reproductive toxicity

Conclusion/Summary : Mixture.Not fully tested.

Teratogenicity

Conclusion/Summary : Mixture.Not fully tested.

Specific target organ toxicity (single exposure)
Not available.

Specific target organ toxicity (repeated exposure)
Not available.

Aspiration hazard

Product/ingredient name	Result

Miscellaneous Compounds Distillates, petroleum, hydrotreated middle	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.
Inhalation : No known significant effects or critical hazards.
Skin contact : Causes skin irritation.
Ingestion : Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness
Inhalation : No specific data.
Skin contact : Adverse symptoms may include the following:
irritation
redness
Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.
Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.
Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Mixture.Not fully tested.

General : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (dusts and mists)	7.81 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Titanium dioxide			
	Acute LC50 > 1,000,000 µg/l Marine water	Fish - Mummichog	96 h
	Acute LC50 > 1,000 mg/l Fresh water	Fish - Fathead minnow	96 h
	Acute LC50 13 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h
	Acute LC50 6.5 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h
	Acute EC50 19.3 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h
	Acute EC50 27.8 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h
	Acute EC50 35.306 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h

Conclusion/Summary : Not available.

Persistence and degradability

Conclusion/Summary : Not available.

Bioaccumulative potential

Product/ingredient name	LogPow	BCF	Potential
Titanium dioxide		352.00	low

Mobility in soil

Soil/water partition coefficient (KOC)	:	Not available.
Other adverse effects	:	No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Acute hazardous waste "P" List: Not listed

United States - RCRA Toxic hazardous waste "U" List: Not listed

Section 14. Transport information

U.S. DOT Classification	:	Not regulated for transportation.
ICAO/IATA	:	Not classified as dangerous good under transport regulations.
IMO/IMDG (maritime)	:	Not classified as dangerous good under transport regulations.

Section 15. Regulatory information

U.S. Federal regulations : **United States - TSCA 12(b) - Chemical export notification:** None of the components are listed.
United States - TSCA 4(a) - Final Test Rules: Not listed
United States - TSCA 4(a) - ITC Priority list: Not listed
United States - TSCA 4(a) - Proposed test rules: Not listed

United States - TSCA 4(f) - Priority risk review: Not listed
United States - TSCA 5(a)2 - Final significant new use rules: Not listed
United States - TSCA 5(a)2 - Proposed significant new use rules: Not listed
United States - TSCA 5(e) - Substances consent order: Not listed
United States - TSCA 6 - Final risk management: Not listed
United States - TSCA 6 - Proposed risk management: Not listed
United States - TSCA 8(a) - Chemical risk rules: Not listed
United States - TSCA 8(a) - Dioxin/Furane precusor: Not listed
United States - TSCA 8(a) - Chemical Data Reporting (CDR): Not determined
United States - TSCA 8(a) - Preliminary assessment report (PAIR): Not listed
United States - TSCA 8(c) - Significant adverse reaction (SAR): Not listed
United States - TSCA 8(d) - Health and safety studies: Not listed
United States - EPA Clean water act (CWA) section 307 - Priority pollutants: Not listed
United States - EPA Clean water act (CWA) section 311 - Hazardous substances: Not listed
United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Flammable substances: Not listed
United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Toxic substances: Not listed
United States - Department of commerce - Precursor chemical: Not listed

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)	:	Not listed
Clean Air Act Section 602 Class I Substances	:	Not listed
Clean Air Act Section 602 Class II Substances	:	Not listed
DEA List I Chemicals (Precursor Chemicals)	:	Not listed
DEA List II Chemicals (Essential Chemicals)	:	Not listed

US. EPA CERCLA Hazardous Substances (40 CFR 302)

not applicable

SARA 311/312

Classification	:	Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Classification
Miscellaneous Compounds Distillates, petroleum, hydrotreated middle	10 - 30	AH
Titanium dioxide	5 - 10	CH

SARA 313
Not applicable.

State regulations

Massachusetts : The following components are listed:
Mica
Iron oxide
Titanium dioxide

New York : None of the components are listed.

New Jersey : The following components are listed:
Mica
Iron oxide
Titanium dioxide

Pennsylvania : The following components are listed:
Iron oxide

Titanium dioxide

California Prop. 65
WARNING: This product contains a chemical known to the State of California to cause cancer.

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada inventory : All components are listed or exempted.

International regulations

International lists : **Australia inventory (AICS):** All components are listed or exempted.
Taiwan inventory (CSNN): Not determined.
Malaysia Inventory (EHS Register): Not determined.
EINECS: All components are listed or exempted.
Japan inventory: Not determined.
China inventory (IECSC): All components are listed or exempted.
Korea inventory: All components are listed or exempted.
New Zealand Inventory of Chemicals (NZIoC): Not determined.

Philippines inventory (PICCS): All components are listed or exempted.

Chemical Weapons Convention List Schedule I Chemicals	:	Not listed
Chemical Weapons Convention List Schedule II Chemicals	:	Not listed
Chemical Weapons Convention List Schedule III Chemicals	:	Not listed

Section 16. Other information

History

Date of printing	:	05/21/2015
Date of issue/Date of revision	:	05/18/2015
Date of previous issue	:	10/30/2014
Version	:	1.1
Key to abbreviations	:	ATE = Acute Toxicity Estimate BCF = Bioconcentration Factor GHS = Globally Harmonized System of Classification and Labelling of Chemicals IATA = International Air Transport Association IBC = Intermediate Bulk Container IMDG = International Maritime Dangerous Goods LogPow = logarithm of the octanol/water partition coefficient MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution) UN = United Nations
References	:	Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. Particularly this information may not be valid for such material used in conjunction with any other materials or in any process, unless specified in the text.

Safety Data Sheet

Revision Date: 01/06/17
www.restek.com

1. IDENTIFICATION

Catalog Number / Product Name:	**31276 / Dibenzo(a,h)anthracene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	7
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Carcinogenicity Category 2
GHS Signal Word:	Warning
GHS Hazard:	Suspected of causing cancer.
GHS Precautions:	
Safety Precautions:	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF exposed or concerned: Get medical advice/attention.
Storage:	Store locked up.
Disposal:	Dispose of contents/container according to section 13 of the SDS.
Single Exposure Target Organs:	No data available.
Repeated Exposure Target Organs:	No data available.

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Dichloromethane	75-09-2	200-838-9	99.900000
dibenz (a,h) anthracene	53-70-3	200-181-8	0.100000

4. FIRST-AID MEASURES

Inhalation:	Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately
Eyes:	Immediately flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention and monitor the eye daily as advised by your physician. Serious harm (damage) may result if treatment is delayed. Continue to flush eyes while awaiting medical attention
Skin Contact:	Wash with soap and water. Remove contaminated clothing, launder immediately, and discard contaminated leather goods. Get medical attention immediately.
Ingestion:	Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS. Never give anything by mouth to an unconscious person

5. FIRE- FIGHTING MEASURES

Extinguishing Media:	Use alcohol resistant foam, carbon dioxide, or dry chemical when fighting fires. Water or foam may cause frothing if liquid is burning but it still may be a useful extinguishing agent if carefully applied to the surface of the fire. Do Not direct a stream of water into the hot burning liquid. Use methods suitable to fight surrounding fire.
Fire and/or Explosion Hazards:	No data.
Fire Fighting Methods and Protection:	Use methods for the surrounding fire.
Hazardous Combustion Products:	Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment:	Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.
Methods for Clean-up:	Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions:	Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area.
Storage Technical Measures and Conditions:	Store in a cool dry place. Isolate from incompatible materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Dichloromethane	75-09-2	2300 ppm IDLH	No data available.	50 ppm TWA	25 ppm TWA; 125 ppm STEL (15 min. TWA)
dibenz (a,h) anthracene	53-70-3	No data available.	No data available.	No data available.	No data available.

Personal Protection:

Engineering Measures:	Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.
Respiratory Protection:	Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Wear additional eye protection such as chemical splash goggles and/or face shield when the possibility exists for eye contact with splashing or spraying

	liquid, or airborne material. Do not wear contact lenses. Have an eye wash station available.
Skin Protection:	Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.
Medical Conditions Aggravated By Exposure:	Eye disease Skin disease including eczema and sensitization Respiratory disease including asthma and bronchitis

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	Colorless
Odor:	Strong
Physical State:	No data available.
pH:	No data available.
Vapor Pressure:	No data available.
Vapor Density:	2.93 (air = 1)
Boiling Point:	No data available.
Melting Point:	-96.7 °C
Flash Point:	No data available.
Upper Flammable/Explosive Limit, % in air:	No data available.
Lower Flammable/Explosive Limit, % in air:	No data available.
Autoignition Temperature:	556 deg C
Decomposition Temperature:	No data available.
Specific Gravity:	1.3254 - 1.3258 g/cm3 at 20 °C
Evaporation Rate:	No data available.
Odor Threshold:	ND
Solubility:	Moderate; 50-99%
Partition Coefficient: n-octanol in water:	No data available.
VOC % by weight:	0
Molecular Weight:	No data available.

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	No data available.Contamination High temperatures
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents Caustics (bases)
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation Absorption Ingestion Skin contact Eye contact
Target Organs Potentially Affected By Exposure:	Skin, Cardiovascular System, Eyes, Liver
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity:	Harmful! Can cause systemic damage (see "Target Organs)Inhalation may cause severe central nervous system depression (including unconsciousness).
Skin Contact:	Contact causes severe skin irritation and possible burns.
Skin Absorption:	Harmful if absorbed through the skin. May cause severe irritation and systemic damage.
Eye Contact:	Contact with the eyes may cause moderate to severe eye injury. Eye contact may result in tearing and reddening, but not likely to permanently injure eye tissue. Temporary vision impairment (cloudy or blurred vision) is possible.
Ingestion Irritation:	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.
Ingestion Toxicity:	Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	Contains a probable or known human carcinogen.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Inhalation:	Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic

damage upon prolonged and/or repeated exposure (see "Target Organs)

Skin Absorption: Upon prolonged or repeated exposure, harmful if absorbed through the skin. May cause severe irritation and systemic damage

Component Toxicological Data:
NIOSH:

Chemical Name	CAS No.	LD50/LC50
Methane, dichloro-	75-09-2	Inhalation LC50 Rat 53 mg/L 6 h

Component Carcinogenic Data:
OSHA:

Chemical Name	CAS No.	
Methylene chloride	75-09-2	25 ppm TWA (8 hr.); 125 ppm STEL (15 min.); 12.5 ppm Action Level (see 29 CFR 1910.1051); effective date for respiratory protection for certain employers to acheive the 8-hour TWA PEL is August 31, 1998; the start up date to install engineering controls is December 10, 1998.; {OSHA - 29 CFR 1910 Specifically Regulate
Dibenz[a,h]anthracene	53-70-3	Present

ACGIH:

Chemical Name	CAS No.	
Dichloromethane	75-09-2	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

NIOSH:

Chemical Name	CAS No.	
Methylene chloride	75-09-2	potential occupational carcinogen

NTP:

Chemical Name	CAS No.
No data available.	

IARC:

Chemical Name	CAS No.	Group No.
No data.		Group 1
Dichloromethane	75-09-2	Group 2A
Dibenz[a,h]anthracene	53-70-3	Group 2A
No data.		Group 2B

12. ECOLOGICAL INFORMATION

Overview: Moderate ecological hazard. This product may be dangerous to plants and/or wildlife. Keep out of waterways.
Mobility: No data
Persistence: No data
Bioaccumulation: No data
Degradability: No data
Ecological Toxicity Data: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.
Disposal Methods: Incinerate spent or discarded material a permitted hazardous waste facility.
Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:
DOT Proper Shipping Name: Dichloromethane
UN Number: UN1593
Hazard Class: 6.1
Packing Group: III

International:

IATA Proper Shipping Name:	Dichloromethane
UN Number:	UN1593
Hazard Class:	6.1
Packing Group:	III

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available.			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Dichloromethane	75-09-2	X	X	-	X
dibenz (a,h) anthracene	53-70-3	X	X	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Dichloromethane Dichloromethane (Methylene chloride)	75-09-2	Prop 65 Cancer
Dibenz[a,h]anthracene	53-70-3	Prop 65 Cancer

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Dichloromethane	75-09-2	X	X	X	X
dibenz (a,h) anthracene	53-70-3	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 05/15/14

Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available.

Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding prodcuts described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/04/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Dieldrin
Product Number	:	33491
Brand	:	Sigma-Aldrich
Index-No.	:	602-049-00-9
CAS-No.	:	60-57-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 2), H300
Acute toxicity, Dermal (Category 1), H310
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H300 + H310	Fatal if swallowed or in contact with skin
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.

P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P262	Do not get in eyes, on skin, or on clothing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P350 + P310	IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,7,8,8a-octahydro-6,7-epoxy-1,4:5,8-dimethanonaphthalene
Formula	:	$C_{12}H_8Cl_6O$
Molecular weight	:	380.91 g/mol
CAS-No.	:	60-57-1
EC-No.	:	200-484-5
Index-No.	:	602-049-00-9

Hazardous components

Component	Classification	Concentration
Dieldrin		
	Acute Tox. 2; Acute Tox. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H351, H372, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Dieldrin	60-57-1	TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Reproductive effects Confirmed animal carcinogen with unknown relevance to humans		

		Danger of cutaneous absorption		
		TWA	0.250000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.250000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Liver damage Reproductive effects Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.25 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A Potential for dermal absorption		
		TWA	0.25 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.25 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		PEL	0.25 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 143 - 144 °C (289 - 291 °F) - lit.
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 38.3 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

Additional Information
RTECS: IO1750000

Discomfort, Headache, Nausea, Vomiting, Dizziness, Tremors, tonic convulsions, clonic spasms, Coma., respiratory failure, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Blood - Irregularities - Based on Human Evidence
Blood - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LC50 - Carassius auratus (goldfish) - 1.6 µg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 79.5 µg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solids, organic, n.o.s. (Dieldrin)
Reportable Quantity (RQ): 1 lbs
Marine pollutant:yes
Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin)

Marine pollutant:yes

IATA

UN number: 2811 Class: 6.1 Packing group: I

Proper shipping name: Toxic solid, organic, n.o.s. (Dieldrin)

IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Dieldrin	60-57-1	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Dieldrin	60-57-1	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H300	Fatal if swallowed.
H300 + H310	Fatal if swallowed or in contact with skin
H310	Fatal in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if swallowed.

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 05/27/2016 Print Date: 07/04/2016

SAFETY DATA SHEET

Version 5.7
Revision Date 06/03/2016
Print Date 07/04/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Diesel Fuel No. 2
Product Number	:	UST147
Brand	:	Sigma-Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, Central nervous system, H335, H336
Specific target organ toxicity - repeated exposure, Oral (Category 2), Liver, Blood, H373
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, H373

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H373	May cause damage to organs (Liver, Blood) through prolonged or repeated exposure if swallowed.
H373	May cause damage to organs (Central nervous system) through prolonged or repeated exposure if inhaled.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Hazardous components

Component		Classification	Concentration
Methylene chloride			
CAS-No. EC-No. Index-No.	75-09-2 200-838-9 602-004-00-3	Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; STOT RE 2; H315, H319, H335, H336, H351, H373, H373	>= 90 - <= 100 %
Fuels, diesel, no. 2			
CAS-No. EC-No. Index-No.	68476-34-6 270-676-1 649-227-00-2	Flam. Liq. 4; Carc. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H227, H304, H336, H351, H411	>= 0.1 - < 1 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Move out of dangerous area.Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store at Room Temperature.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Potential Occupational Carcinogen See Appendix A		
Methylene chloride	75-09-2	TWA	50.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Carboxyhemoglobinemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section)		

		Confirmed animal carcinogen with unknown relevance to humans		
		TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Carboxyhemoglobinemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Substance listed; for more information see OSHA document 1910.1052		
		Substance listed; for more information see OSHA document 1910.1052		
		See Table Z-2		
		PEL	25.000000 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1052 This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole OSHA specifically regulated carcinogen		
		STEL	125.000000 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1052 This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole OSHA specifically regulated carcinogen		
		PEL	25 ppm 87 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		see section 5202		
		STEL	125 ppm 435 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		see section 5202		
Fuels, diesel, no. 2	68476-34-6	TWA	100.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Dermatitis Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption varies		
		TWA	100.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Dermatitis Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption varies		
		TWA	100 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Dermatitis Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption varies		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Methylene chloride	75-09-2	Dichloromethane	0.3000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available

n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a

known or anticipated carcinogen by NTP.

OSHA: OSHA specifically regulated carcinogen (Methylene chloride)

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1593 Class: 6.1 Packing group: III
Proper shipping name: Dichloromethane, solution
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1593 Class: 6.1 Packing group: III EMS-No: F-A, S-A

Proper shipping name: DICHLOROMETHANE, SOLUTION

IATA
UN number: 1593 Class: 6.1 Packing group: III
Proper shipping name: Dichloromethane, solution

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methylene chloride	75-09-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Methylene chloride	75-09-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Methylene chloride	75-09-2	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Methylene chloride	75-09-2	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Asp. Tox.	Aspiration hazard
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H227	Combustible liquid.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H373	May cause damage to organs (/$/*_2ORG_REP_ORA/$/) through prolonged or repeated exposure if swallowed.
H411	Toxic to aquatic life with long lasting effects.
Skin Irrit.	Skin irritation
STOT RE	Specific target organ toxicity - repeated exposure
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating
Health hazard: 2
Chronic Health Hazard: *

Flammability:	0
Physical Hazard	1

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.7 Revision Date: 06/03/2016 Print Date: 07/04/2016

SAFETY DATA SHEET

Creation Date 06-Aug-2010 **Revision Date** 30-Oct-2014 **Revision Number** 2

1. Identification

Product Name **Ethylbenzene**

Cat No. : **AC433800000; AC433800010; AC433801000**

Synonyms Ethylbenzol; Phenylethane

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Acute Inhalation Toxicity - Vapors	Category 4
Carcinogenicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Harmful if inhaled
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO_2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects

3. Composition / information on ingredients

Component	CAS-No	Weight %
Ethylbenzene	100-41-4	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention. Aspiration into lungs can produce severe lung damage.

Ingestion Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms/effects Breathing difficulties. . Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: May cause central nervous system depression

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

Unsuitable Extinguishing Media Do not use a solid water stream as it may scatter and spread fire

Flash Point 15 °C / 59 °F
Method - No information available

Autoignition Temperature 432 °C / 810 °F
Explosion Limits
Upper 6.8%
Lower 1.2%
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge Yes

Specific Hazards Arising from the Chemical
Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Ethylbenzene	TWA: 20 ppm	(Vacated) TWA: 100 ppm (Vacated) TWA: 435 mg/m^3 (Vacated) STEL: 125 ppm (Vacated) STEL: 545 mg/m^3 TWA: 100 ppm TWA: 435 mg/m^3	IDLH: 800 ppm TWA: 100 ppm TWA: 435 mg/m^3 STEL: 125 ppm STEL: 545 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Ethylbenzene	TWA: 100 ppm TWA: 434 mg/m^3 STEL: 125 ppm STEL: 543 mg/m^3	TWA: 100 ppm TWA: 435 mg/m^3 STEL: 125 ppm STEL: 545 mg/m^3	TWA: 20 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-95 °C / -139 °F
Boiling Point/Range	136 °C / 276.8 °F
Flash Point	15 °C / 59 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.8%
Lower	1.2%
Vapor Pressure	No information available
Vapor Density	No information available
Relative Density	0.860
Solubility	Slightly soluble in water
Partition coefficient; n-octanol/water	No data available

Autoignition Temperature 432 °C / 810 °F
Decomposition Temperature No information available
Viscosity No information available
Molecular Formula C8 H10
Molecular Weight 106.17

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylbenzene	3500 mg/kg (Rat)	15400 mg/kg (Rabbit)	17.2 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation May cause eye, skin, and respiratory tract irritation

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Ethylbenzene	100-41-4	Group 2B	Not listed	A3	X	Not listed

IARC: (International Agency for Research on Cancer)
Group 2B - Possibly Carcinogenic to Humans
IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: May cause central nervous system depression

Endocrine Disruptor Information No information available

Other Adverse Effects See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Do not empty into drains. The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Ethylbenzene	2.6 - 11.3 mg/L EC50 72 h 438 mg/L EC50 > 96 h 4.6 mg/L EC50 = 72 h 1.7 - 7.6 mg/L EC50 96 h	9.6 mg/L LC50 96 h 9.1 - 15.6 mg/L LC50 96 h 32 mg/L LC50 96 h 7.55 - 11 mg/L LC50 96 h 4.2 mg/L LC50 96 h 11.0 - 18.0 mg/L LC50 96 h	EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h	1.8 - 2.4 mg/L EC50 48 h

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

Component	log Pow
Ethylbenzene	3.118

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1175
Proper Shipping Name ETHYLBENZENE
Hazard Class 3
Packing Group II

TDG

UN-No UN1175
Proper Shipping Name ETHYLBENZENE
Hazard Class 3
Packing Group II

IATA

UN-No UN1175
Proper Shipping Name ETHYLBENZENE
Hazard Class 3
Packing Group II

IMDG/IMO

UN-No UN1175
Proper Shipping Name ETHYLBENZENE
Hazard Class 3
Packing Group II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed The product is classified and labeled

according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Ethylbenzene	X	X	-	202-849-4	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Ethylbenzene	100-41-4	>95	0.1

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Ethylbenzene	X	1000 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Ethylbenzene	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Ethylbenzene	1000 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Ethylbenzene	100-41-4	Carcinogen	54 µg/day 41 µg/day	Carcinogen

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Ethylbenzene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class B2 Flammable liquid
D2A Very toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 06-Aug-2010
Revision Date 30-Oct-2014
Print Date 30-Oct-2014
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

SAFETY DATA SHEET

Version 4.17
Revision Date 03/03/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Trichlorofluoromethane
Product Number	:	254991
Brand	:	Aldrich
CAS-No.	:	75-69-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Dermal (Category 4), H312

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word	Warning
Hazard statement(s)	
H312	Harmful in contact with skin.
Precautionary statement(s)	
P280	Wear protective gloves/ protective clothing.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P363	Wash contaminated clothing before reuse.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Fluorotrichloromethane CFC-11

Formula	:	CCl_3F CCl_3F
Molecular weight	:	137.37 g/mol
CAS-No.	:	75-69-4
EC-No.	:	200-892-3

Hazardous components

Component	Classification	Concentration
Trichlorofluoromethane		
	Acute Tox. 4; H312	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas, Hydrogen fluoride

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature 2 - 8 °C

Contents under pressure.
Storage class (TRGS 510): Non Combustible Liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Trichlorofluoromethane	75-69-4	C	1,000.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Cardiac sensitization Not classifiable as a human carcinogen		
		C	1,000.000000 ppm 5,600.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1,000.000000 ppm 5,600.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 30 min

Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-110.99 - -109.99 °C (-167.78 - -165.98 °F)
f)	Initial boiling point and boiling range	23.7 °C (74.7 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	885.7 hPa (664.3 mmHg) at 20.0 °C (68.0 °F) 2,701.2 hPa (2,026.1 mmHg) at 55.0 °C (131.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.494 g/cm3 at 25 °C (77 °F)
n)	Water solubility	1 g/l
o)	Partition coefficient: n-octanol/water	log Pow: 2.53
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available

t) Oxidizing properties No data available

9.2 Other safety information

Surface tension 18.0 mN/m at 25.0 °C (77.0 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Sodium/sodium oxides, Potassium, Magnesium, Aluminum, Zinc

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 15,000 mg/kg

LC50 Inhalation - Rat - 0.3 h - 130000 ppm
Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: PB6125000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated., Nausea, Dizziness, Headache, Vomiting, Diarrhoea, Abdominal pain, Weakness, Unconsciousness

Liver -

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Trichlorofluoromethane)
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Trichlorofluoromethane	75-69-4	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
H312	Harmful in contact with skin.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.17 Revision Date: 03/03/2015 Print Date: 05/01/2016

SAFETY DATA SHEET

Halocarbon R-12 (Dichlorodifluoromethane)

Section 1. Identification

GHS product identifier : Halocarbon R-12 (Dichlorodifluoromethane)

Chemical name : dichlorodifluoromethane

Other means of identification : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

Product use : Synthetic/Analytical chemistry.

Synonym : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

SDS # : 001018

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Emergency telephone number (with hours of operation) : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Liquefied gas
HAZARDOUS TO THE OZONE LAYER - Category 1

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.
Harms public health and the environment by destroying ozone in the upper atmosphere.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position.

Prevention : Use and store only outdoors or in a well ventilated place.

Response : Not applicable.

Storage : Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Refer to manufacturer/supplier for information on recovery/recycling.

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Section 2. Hazards identification

Hazards not otherwise classified : Liquid can cause burns similar to frostbite.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : dichlorodifluoromethane

Other means of identification : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12

CAS number/other identifiers

CAS number : 75-71-8

Product code : 001018

Ingredient name	%	CAS number
Methane, dichlorodifluoro-	100	75-71-8

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if adverse health effects persist or are severe. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Liquid can cause burns similar to frostbite.

Inhalation : Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

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Section 4. First aid measures

Skin contact : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : Ingestion of liquid can cause burns similar to frostbite.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
frostbite

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
frostbite

Ingestion : Adverse symptoms may include the following:
frostbite

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

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Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). May be harmful to the environment if released in large quantities.

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Avoid breathing gas. Avoid release to the environment. Refer to special instructions/safety data sheet. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

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Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Methane, dichlorodifluoro-	**ACGIH TLV (United States, 3/2012).** TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **NIOSH REL (United States, 1/2013).** TWA: 4950 mg/m³ 10 hours. TWA: 1000 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

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Section 9. Physical and chemical properties

Appearance

Physical state	:	Gas. [Liquefied gas]
Color	:	Colorless.
Molecular weight	:	120.91 g/mole
Molecular formula	:	C-Cl2-F2
Boiling/condensation point	:	-29.8°C (-21.6°F)
Melting/freezing point	:	-158°C (-252.4°F)
Critical temperature	:	111.85°C (233.3°F)
Odor	:	Characteristic.
Odor threshold	:	Not available.
pH	:	Not available.
Flash point	:	[Product does not sustain combustion.]
Burning time	:	Not applicable.
Burning rate	:	Not applicable.
Evaporation rate	:	Not available.
Flammability (solid, gas)	:	Not available.
Lower and upper explosive (flammable) limits	:	Not available.
Vapor pressure	:	84.9 (psia)
Vapor density	:	4.2 (Air = 1)
Specific Volume (ft ^{3}/lb)	:	3.1746
Gas Density (lb/ft ^{3})	:	0.315
Relative density	:	Not applicable.
Solubility	:	Not available.
Solubility in water	:	0.3 g/l
Partition coefficient: n-octanol/water	:	2.16
Auto-ignition temperature	:	Not available.
Decomposition temperature	:	Not available.
SADT	:	Not available.
Viscosity	:	Not applicable.

Section 10. Stability and reactivity

Reactivity	:	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	No specific data.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

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Section 10. Stability and reactivity

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Liquid can cause burns similar to frostbite.

Inhalation : Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Skin contact : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

Ingestion : Ingestion of liquid can cause burns similar to frostbite.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
frostbite

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
frostbite

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Section 11. Toxicological information

Ingestion : Adverse symptoms may include the following: frostbite

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Methane, dichlorodifluoro-	2.16	6.17	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

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Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Dichlorodifluoromethane; Methane, dichlorodifluoro-	75-71-8	Listed	U075

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1028	UN1028	UN1028	UN1028	UN1028
UN proper shipping name	DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12	DICHLORODIFLUOROMETHANE; OR REFRIGERANT GAS R 12	DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12	DICHLORODIFLUOROMETHANE (REFRIGERANT GAS R 12)	DICHLORODIFLUOROMETHANE
Transport hazard class(es)	2.2	2.2	2.2	2.2	2.2
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Reportable quantity** 5000 lbs / 2270 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 75 kg **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** T50	**Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 75 kg **Cargo Aircraft Only** Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

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Section 14. Transport information

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

TSCA 12(b) annual export notification: dichlorodifluoromethane

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Methane, dichlorodifluoro-	100	No.	Yes.	No.	No.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	dichlorodifluoromethane	75-71-8	100
Supplier notification	dichlorodifluoromethane	75-71-8	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

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Section 15. Regulatory information

New Jersey : This material is listed.

Pennsylvania : This material is listed.

Canada inventory : This material is listed or exempted.

International regulations

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals : Not listed

Canada

WHMIS (Canada) : Class A: Compressed gas.
CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	0
Physical hazards	2

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

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Section 16. Other information

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing : 5/21/2015.

Date of issue/Date of revision : 5/21/2015.

Date of previous issue : 5/21/2015.

Version : 2

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health
TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

References : Not available.

Indicates information that has changed from previously issued version.

Other special considerations : WARNING: Contains (Dichlorodifluoromethane), a substance which harms the public health and environment by destroying ozone in the upper atmosphere.

Notice to reader

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Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

1. IDENTIFICATION

Product Identifier	No. 2 Fuel Oil
Synonyms:	No. 2 Heating Oil, #2 Fuel Oil, Heating Oil Plus™, Low Sulfur Heating Oil (LSHO), Ultra Low Sulfur Heating Oil (ULSHO)
Intended use of the product:	Fuel
Contact:	Global Companies LLC Water Mill Center 800 South St. Waltham, MA 02454-9161 www.globalp.com
Contact Information:	EMERGENCY TELEPHONE NUMBER (24 hrs.): CHEMTREC (800) 424-9300 COMPANY CONTACT (business hours): 800-542-0778

2. HAZARD IDENTIFICATION

According to OSHA 29 CFR 1910.1200 HCS

Classification of the Substance or Mixture

Classification (GHS-US):

Flam. Liquid	Category 3	H226
Skin Corrosion/Irritation	Category 2	H315
Aspiration Hazard	Category 1	H304
Acute toxicity – Inhalation	Category 4	H332
STOT SE	Category 3	H336
Carcinogenicity	Category 2	H350
Aquatic Chronic	Category 2	H411
Eye damage/Irritation	Category 2	H319

Labeling Elements

Signal Word (GHS-US):	**Danger**
Hazard Statements (GHS-US):	H226 – Flammable liquid and vapor. H315 – Causes Skin irritation. H304 – May be fatal if swallowed and enters airways. H332—Harmful if inhaled. H336 – May cause drowsiness or dizziness. H350 – May cause cancer. H411 – Toxic to aquatic life with long lasting effects. H319 – May cause eye damage/irritation.
Precautionary Statements (GHS-US):	P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking. P233 - Keep container tightly closed. P240 – Ground/bond container and receiving equipment.

P241 – Use explosion-proof electrical/ventilating/lighting equipment pursuant to applicable electrical code.
P242 – Use only non-sparking tools.
P243 – Take precautionary measures against static discharge.
P261 – Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 – Wash skin thoroughly after handling.
P271 – Use only outdoors or in a well-ventilated area.
P273 – Avoid release to the environment.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P303+361+353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse with water/shower.
P308+311 - If exposed or concerned: Get medical advice/attention.
P301+310 - If swallowed: Immediately call a poison center/doctor/…
P331 - Do NOT induce vomiting.
P370+P378 – In case of fire use firefighting foam or other appropriate media for Class B fires to extinguish.
P403+235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.
P501 – Dispose of contents/container in accordance with local/regional/national/international regulation.

Other information:

NFPA 704
Health: 1
Fire: 2
Reactivity: 0

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Composition Information
Mixture

Name	Product Identifier (CAS#)	% (w/w)	Classification
No. 2 Fuel Oil	68476-30-2	95-100	Flam Liq. 3, H226; Skin Irrit. 2, H315; Aspiration 1, H304; STOT SE 3, H336; Carc.2. H350; Aquatic chronic 2, H411
Methyl Esters	N/A	0-5	N/A
Naphthalene	91-20-3	0.1	Carc. 2, H351; Acute Tox. 4, H302; Aquatic Acute 1, H400; Aquatic Chronic 1, H411

Additional Formulation Information:
No. 2 Fuel Oil consists of C9+ hydrocarbons resulting from distillation of crude oil.

Low Sulfur Heating Oil typically contains less than 500 ppm of sulfur

Ultra Low Sulfur Heating Oil typically contains less than 15 ppm of sulfur

4. FIRST AID MEASURES

Route	Measures
Inhalation	Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.
Ingestion	Aspiration Hazard: DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Ingestion may cause gastrointestinal disturbances including irritation, nausea, vomiting, and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory failure, and death.
Eye Contact	In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention. In case of contact lenses, remove immediately.
Skin Contact	Remove contaminated clothing and shoes. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and of the area of the body burned.

Most Important Symptoms
Contact with eyes and face may cause irritation. Long-term exposure may cause dermatitis (itching, irritation, pain and swelling).

Inhalation may cause irritation and significant or long term exposure could cause respiratory insufficiency and pulmonary edema.

Ingestion may cause aspiration, gastrointestinal disturbance, and CNS effects.

Immediate Medical Attention and Special Treatment
For contact with skin or eyes, immediately wash or flush contaminated eyes with gently flowing water. If possible, irrigate each eye continuously with 0.9% saline (NS). If ingested, rinse mouth. Do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).

If inhaled, administer oxygen or establish a patent airway if breathing is labored. Suction if necessary. Monitor closely, anticipate seizures. Consider orotracheal or nostracheal intubation of airway control if patient is unconscious or is in severe respiratory distress.

Discard any clothing or shoes contaminated as they may be flammable.

5. FIRE-FIGHTING MEASURES

Extinguishing Media
Foam, carbon dioxide, dry chemical are most suitable

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, C02, water spray, firefighting foam, or Halon. Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment.

LARGE FIRES: Foam, carbon dioxide, dry chemical. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Specific Hazards / Products of Combustion
Moderate fire hazard when exposed to heat or flame with a very low flash point. Product is flammable and easily ignited when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Combustion may produce smoke, carbon monoxide and other products of incomplete combustion.

Special Precautions and Protective Equipment for Firefighters
Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water.

For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied firefighting foam.

Fighting Equipment/Instructions
Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH- approved pressure-demand self-contained breathing apparatus with full face piece and protective clothing.

Refer to Section 9 for fire properties of this chemical including flash point, auto ignition temperature, and explosive limits.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPCC, SPILL CONTINGENCY or EMERGENCY PLAN.

Personal Precautions
Due to high vapor density, flammable / toxic vapors may be present in low lying areas, dikes, pits, drains, or trenches. Vapors may accumulate in low lying areas and reach ignitable concentrations. Ventilate the area. Use of non-sparking tools and intrinsically safe equipment is recommended. Potential for flammable atmosphere should be monitored using a combustible gas indicator positioned downwind of the spill area. Refer to Sections 2 and 7 for further hazard warnings and handling instructions.

Use appropriate personal protective equipment to prevent eye/skin contact and absorption. Use NIOSH approved respiratory protection, if warranted, to prevent exposures above permissible limits. Refer to Section 8. Contaminated clothing should not be near sources of ignition.

Emergency Measures
As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Consider wind direction. Secure all ignition sources (flame, spark, hot work, hot metal, etc.) from area. Evaluate the direction of product travel, diking sewers, etc. to confirm spill areas. Do not touch or walk-through spilled material. For large spills, isolate initial action distance downwind 1,000 ft. (300 m).

Environmental Precautions
Stop the spill to prevent environmental release if it can be done safely. Product is toxic to aquatic life. Take action to isolate environmental receptors including drains, storm sewers and natural water bodies. Keep on impervious surface if at all possible. Use water sparingly to prevent product from spreading. Foam and absorbents may be used to reduce / prevent airborne release.

Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Follow federal, state or local requirements for reporting environmental release where necessary. Refer to Section 15 for further information.

Containment and Clean-Up Methods
Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of firefighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with dry earth, sand or other non-combustible, inert oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container with clean, non-sparking tools for reclamation or disposal. Response and cleanup crews must be properly trained and must utilize proper protective equipment. Refer to Section 8 for appropriate protective equipment.

7. HANDLING AND STORAGE

USE ONLY AS A FUEL.
DO NOT SIPHON BY MOUTH.

Handling Precautions
Handle as a flammable liquid. Keep away from heat, sparks, and open flame. No smoking. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer pursuant to NFPA 70 and API RP 2003 to

reduce the possibility of static-initiated fire or explosion. Follow precautions to prevent static initiated fire.

Use good personal hygiene practices. Use only with protective equipment specified in Section 8. Avoid repeated and/or prolonged skin exposure. Use only outdoors or in well ventilated areas. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API RP 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage
Large quantities of fuel oil are stored in tanks or portable containers at an ambient storage temperature. Separate from incompatible chemicals (Refer to Section 10) by distance or secondary containment. Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers that are clearly labeled. Label all secondary containers that this material is transferred into with the chemical name and associated hazard(s). Empty product containers or vessels may contain flammable vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Storage tanks should have a venting system. If stored in small containers, the area should be well ventilated, away from ignition sources and protected from potential damage or vehicular traffic. Post “No Smoking” signs in product storage areas. This storage area should comply with NFPA 30 “Flammable and Combustible Liquid Code” or applicable building code. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 “Cleaning Mobile Tanks in Flammable and Combustible Liquid Service” and API RP 2015 “Safe Entry and Cleaning of Petroleum Storage Tanks”.

Incompatibles
Keep away from strong oxidizers, ignition sources and heat.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits

Component	CAS #	List	Value
No. 2 Fuel Oil	68476-30-2	ACGIH TLV-TWA	100 mg/m3*
Naphthalene	91-20-3	ACGIH TLV-TWA OSHA PEL ACGIH STEL	10 ppm 10 ppm 15 ppm

*Critical effects; Skin; A3; CNS impairment.

Engineering Controls
Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Intrinsically safe equipment and non-sparking tools shall be used in circumstances where concentrations may exceed lower flammable limits. Grounding and bonding shall be used to prevent accumulation and discharge of static electricity. Emergency shower and eyewash should be provided in proximity to handling areas in the event of exposure to decontaminate.

Personal Protective Equipment

Exposure	Equipment
Eye / Face	Wear appropriate chemical protective glasses or goggles or face shields to prevent skin and eye contact especially caused from splashing.
Skin	Wear appropriate personal protective clothing to prevent skin contact. Gloves constructed of nitrile, neoprene or PVC are recommended when handling this material. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure.

Exposure	Equipment
Respiratory	A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations. Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Thermal	Product is stored at ambient temperature. No thermal protection is required except for emergency operations involving actual or potential for fire. Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Value	
Appearance	Clear or straw-colored liquid dyed red for distribution	
Odor	Mild petroleum distillate odor.	
Odor Threshold	<1 ppm	
pH	Not available	
Melting Point	-15 ˚F (-26 ˚C)	
Boiling Point Range	320 to 690 ˚F (160 to 366 ˚C)	
Flash Point	>125.6 ˚F (52 ˚C) PMCC	
Evaporation Rate	Slow, varies with conditions	
Flammability	Flammable liquid	
Flammable Limits	0.6 % - 7.5%	
Vapor Pressure	0.009 psia @ 70 ˚F	
Vapor Density	>1	(air=1)
Specific Gravity	0.81-0.88 @ 60 ˚F (16 ˚C)	(water=1)
Solubility	Insoluble in water; miscible with other petroleum solvents.	
Partition Coefficient (N-octanol/water)	Log Kow range of 3.3 to >.6.0	
Autoignition Temperature	494 ˚F (257 ˚C)	
Decomposition Temperature	When heated it emits acrid smoke and irritating vapors.	
Viscosity	>3 cSt	
Percent Volatiles	95-100	

10. STABILITY AND REACTIVITY

Stability
This is a stable material that is flammable liquid (OSHA/GHS hazard category 3). Stable during transport.

Reactivity
Material is not self-reacting. Flammable concentrations may be present in air. Compound can react with oxidizing materials.

Possibility of Hazardous Reactions
Hazardous polymerization will not occur.

Incompatibility
Keep away from strong oxidizers such as nitric and sulfuric acids.

Conditions to Avoid
Avoid high temperatures, open flames, sparks, static electricity, welding, smoking and other ignition sources.

Hazardous Decomposition Products
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
Acute Toxicity (Inhalation LC50)

No. 2 Fuel Oil (68476-30-2)
LC50 Inhalation Rat >4.6 mg/l/4h

Acute Toxicity (Dermal LD50)

No. 2 Fuel Oil (68476-30-2)
LD50 Dermal Rabbit >2000 mg/kg

Acute Toxicity (Oral LD50)

No. 2 Fuel Oil (68476-30-2)
LD50 Oral Rat >12000 mg/kg

Acute Toxicity (Oral LD50)

Methyl Esters
LD50 Oral Rat >14400 mg/kg

Skin Corrosion/Irritation: Prolonged and repeated contact may cause skin irritation leading to dermatitis. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: OSHA: NO, IARC: Group 3, NTP: NO, ACGIH: NOIC:A3, NIOSH: NO

IARC: Group 3 – Not classifiable as to their carcinogenicity to humans ACGIH: A3 – Confirmed animal carcinogen with unknown relevance to humans

Petroleum middle distillates have been shown to produce skin tumors in laboratory animals following repeated and prolonged exposures. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

This product is similar to Diesel Fuel. IARC classifies whole diesel fuel exhaust particulates (byproduct of combustion of this material) carcinogenic to humans (Group 1) and NIOSH regards diesel fuel exhaust particulate as a potential occupational carcinogen.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Specific Target Organ Toxicity (Single Exposure): Inhalation exposure may cause drowsiness or dizziness by inhalation exposure.

Aspiration Hazard: The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Potential Health Effects: Vapor irritating to skin, eyes, nose, and throat. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

WARNING: The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

12. ECOLOGICAL INFORMATION

Toxicity
This material is expected to be toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

Data for Component: No. 2 Fuel Oil (68476-30-2)

Material is toxic to aquatic organisms based on an acute basis (LC50/EC50 >1 but $\leq$ 10 mg/L in the most sensitive species tested).

Material is a long-term aquatic hazard based on a chronic basis (LC50/EC50 >1 but $\leq$ 10 mg/L in the most sensitive species tested).

Persistence and Degradation: This material is not expected to be readily biodegradable.

Bioaccumulative Potential: Not available

Mobility in Soil: Not available

Other Adverse Effects: None known

Other Information: Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options. May be considered a hazardous waste if disposed. Direct solid waste (landfill) or incineration at a solid waste facility is not permissible. Do not discharge to sanitary or storm sewer. Personnel handling waste containers should follow precautions provided in this document.

Shipping containers must be DOT authorized packages. Follow licensure and regulations for transport of hazardous material and hazardous waste as applicable.

14. TRANSPORT INFORMATION

US DOT

UN Identification Number	NA 1993
Proper Shipping Name	Fuel oil (No. 2)
Hazard Class and Packing Group	3, PGIII
Shipping Label	Combustible liquid
Placard / Bulk Package	Combustible liquid, 1993
Emergency Response Guidebook Guide Number	128

IATA Information

UN Identification Number	UN 1993
Proper Shipping Name	Fuel oil (No. 2)
Hazard Class and Packing Group	3, PGIII
ICAO Label	3
Packing Instructions Cargo	355
Max Quantity Per Package Cargo	220L
Packing Instructions Passenger	344Y
Max Quantity per Package	60L

ICAO

UN Identification Number	UN 1993
Shipping Name / Description	Fuel oil (No. 2)
Hazard Class and Packing Group	3, PG III
IMDG Label	3

IMDG

UN Identification Number	UN 1993
Shipping Name / Description	Heating Oil, Light
Hazard Class and Packing Group	3, PGIII
IMDG Label	3
EmS Number	N/A
Marine Pollutant	Yes

15. REGULATORY INFORMATION

U.S. Federal, State, and Local Regulatory Information
Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning And Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	Yes
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	Yes
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Clean Water Act (Oil Spills)
Any spill or release of this product to “navigable waters” (Essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA Section 103 and SARA Section 304 (Release to the Environment)
The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts this material. This product does not contain any chemicals subject to the reporting requirements of CERCLA Section 103 or SARA 304.

SARA Section 313- Supplier Notification
This product does not contain any chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

EPA Notification (Oil Spills)
If the there is a discharge of more than 1,000-gallons of oil into or upon navigable waters of the United States, or if it is the second spill event of 42 gallons or more of oil into water within a twelve (12) month period, a written report must be submitted to the Regional Administrator of the EPA within sixty days of the event.

Pennsylvania Right to Know Hazardous Substance list:
The following product components are cited in the Pennsylvania Special Hazardous Substance List, and are present at levels which require reporting.

Component	CAS	Amount
No. 2 Fuel Oil	68476-30-2	100%

New Jersey Right to Know Hazardous Substance list:
The following product components are cited in the New Jersey Right to Know Hazardous Substance List, and are present at levels which require reporting.

Component	CAS	Amount
No. 2Fuel Oil	68476-30-2	100%

California Proposition 65 WARNING: This product contains chemicals known to the State of California to cause Cancer or Reproductive Toxicity.

Component	CAS	Amount
Naphthalene	91-20-3	<0.1%

U.S. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30.

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

Canadian Regulatory Information (WHMIS)
Class B3 – Combustible Liquid
Class D2A – Materials causing other toxic effects. (Very Toxic)

16. OTHER INFORMATION

Version	4
Issue Date	May 20, 2016
Prior Issue Date	May 3, 2015

Description of Revisions
Revised to meet Globally Harmonized System for chemical hazard communication requirements pursuant to OSHA regulatory revisions 77 FR 17884, March 26, 2012.

Abbreviations

˚F	Degrees Fahrenheit (temperature)
<	Less than
=	Equal to
>	Greater than
AP	Approximately
C	Centigrade (temperature)
kg	Kilogram
L	Liter
mg	Milligrams
mL	Milliliter
mm^2	Square millimeters
mmHg	Millimeters of mercury (pressure)
N/A	Not applicable
N/D	Not determined
ppm	Parts per million
sec	Second
ug	Micrograms

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
AL	Action Level
ANSI	American National Standards Institute
API	American Petroleum Institute
CAS	Chemical Abstract Service
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
EC50	Ecological concentration 50%
EPA	U.S. Environmental Protection Agency
ERPG	Emergency Response Planning Guideline
GHS	Global Harmonized System

HMIS	Hazardous Materials Information System
IARC	International Agency for Research On Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
Koc	Soil Organic Carbon
LC50	Lethal concentration 50%
LD50	Lethal dose 50%
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act Reauthorization Act of 1986 Title III
REL	Recommended Exposure Limit (NIOSH)
RVP	Reid Vapor Pressure
SARA	Superfund Amendments and
SCBA	Self Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
UN	United Nations
UNECE	United Nations Economic Commission for Europe
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Canadian Workplace Hazardous Materials Information System

Disclaimer of Expressed and Implied Warranties

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Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

** End of Safety Data Sheet **

SAFETY DATA SHEET

Issuing Date no data available **Revision Date** 29-Oct-2015 **Revision Number** 1

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier

Product Number	**019**
Product Name	**Hexavalent Chromium - 1000 mg/L, 125 mL**
Synonyms	None

Recommended use of the chemical and restrictions on use

Recommended Use	Laboratory use only
Uses advised against	No information available

Details of the supplier of the safety data sheet

Supplier	ERA a Waters Company
Supplier Address	16341 Table Mountain Parkway, Golden, CO 80403 USA
Non-Emergency Telephone Number	+1-303-431-8454
Supplier Email	sdsinfo@waters.com

Emergency telephone number

Company Emergency Phone Number	In case of EMERGENCY call CHEMTREC Day or Night Within USA and Canada: 800-424-9300 International Call Collect: +1-703-527-3887

2. HAZARDS IDENTIFICATION

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Respiratory sensitization	Category 1
Skin sensitization	Category 1
Germ cell mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 1B

GHS Label elements, including precautionary statements

Emergency Overview

Signal word **Danger**

Hazard Statements

May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause an allergic skin reaction
May cause genetic defects
May cause cancer
May damage fertility or the unborn child

Appearance Yellow **Physical state** Liquid->Liquid **Odor** Odorless

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Avoid breathing dust/fume/gas/mist/vapors/spray
In case of inadequate ventilation wear respiratory protection
Contaminated work clothing should not be allowed out of the workplace
Wear protective gloves
Precautionary Statements - Response
IF exposed or concerned: Get medical advice/attention
Specific treatment (see supplemental first aid instructions on this label)
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation or rash occurs: Get medical advice/attention
Wash contaminated clothing before reuse
Inhalation
IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician

Precautionary Statements - Storage
Store locked up
Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Not applicable
Unknown Toxicity
0 % of the mixture consists of ingredient(s) of unknown toxicity
Other information

Harmful to aquatic life with long lasting effects
Repeated or prolonged skin contact may cause allergic reactions with susceptible persons
Interactions with Other Chemicals
No information available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Note: only the components contributing to the product's GHS hazard classification are listed in this section.

Synonyms None.

Chemical Name	CAS-No	Percent
Potassium Dichromate	7778-50-9	0.25

4. FIRST AID MEASURES

First aid measures

General Advice	Show this safety data sheet to the doctor in attendance.
Eye contact	Rinse thoroughly with plenty of water, also under the eyelids. If symptoms persist, call a physician.
Skin contact	Wash with soap and water. May cause an allergic skin reaction. In the case of skin irritation or allergic reactions see a physician.
Inhalation	MAY CAUSE ALLERGIC RESPIRATORY REACTION. If breathing has stopped, give artificial respiration. Get medical attention immediately. Remove to fresh air. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation. Seek immediate medical attention/advice.
Ingestion	May produce an allergic reaction. If an allergic reaction occurs, stop use and seek medical help right away. Do NOT induce vomiting. Rinse mouth immediately and drink plenty of

water. Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately.

Self-protection of the first aider Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Avoid contact with skin, eyes or clothing. Avoid direct contact with skin. Use barrier to give mouth-to-mouth resuscitation. Use personal protective equipment as required. Wear personal protective clothing (see section 8).

Most important symptoms and effects, both acute and delayed

Most Important Symptoms and Effects Itching. Rashes. Hives. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Coughing and/ or wheezing.

Indication of any immediate medical attention and special treatment needed

Notes to Physician May cause sensitization in susceptible persons. Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media

CAUTION: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical

Product is or contains a sensitizer. May cause sensitization by skin contact. May cause sensitization by inhalation and skin contact.

Uniform Fire Code Sensitizer: Liquid

Hazardous Combustion Products

Carbon oxides.

Explosion Data

Sensitivity to Mechanical Impact No.

Sensitivity to Static Discharge No.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid contact with skin, eyes or clothing. Use personal protective equipment as required. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

Other Information Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions Refer to protective measures listed in Sections 7 and 8. Prevent further leakage or spillage if safe to do so.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Pick up and transfer to properly labeled containers. Soak up with inert absorbent material.

7. HANDLING AND STORAGE

Precautions for safe handling

Handling Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse. Ensure adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment.

Conditions for safe storage, including any incompatibilities

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Store locked up. Keep out of the reach of children.

Incompatible Products None known based on information supplied.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Potassium Dichromate 7778-50-9	TWA: 0.05 mg/m^3 Cr	TWA: 5 µg/m^3 Action Level: 2.5 µg/m^3 Cr (vacated) Ceiling: 0.1 mg/m^3 Ceiling: 0.1 mg/m^3 CrO3 applies to any operations or sectors for which the Hexavalent Chromium standard [29 CFR 1910.1026] is stayed or is otherwise not in effect	IDLH: 15 mg/m^3 Cr(VI) TWA: 0.0002 mg/m^3 Cr

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits NIOSH IDLH Immediately Dangerous to Life or Health

Appropriate engineering controls

Engineering Measures Showers
Eyewash stations
Ventilation systems

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles).

Skin and body protection Wear protective gloves and protective clothing.

Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties

Physical state Liquid->Liquid
Appearance Yellow
Color No information available
Odor Odorless
Odor Threshold No information available

Property	Values	Remarks Method
pH	5	None known
Melting / freezing point	no data available	None known
Boiling point / boiling range	no data available	None known
Flash Point	no data available	None known
Evaporation Rate	no data available	None known
Flammability (solid, gas)	no data available	None known

Flammability Limit in Air		
Upper flammability limit	no data available	
Lower flammability limit	no data available	
Vapor pressure	no data available	None known
Vapor density	no data available	None known
Specific Gravity	1	None known
Water Solubility	Soluble in water	None known
Solubility in other solvents	no data available	None known
Partition coefficient: n-octanol/water	no data available	None known
Autoignition temperature	no data available	None known
Decomposition temperature	no data available	None known
Kinematic viscosity	no data available	None known
Dynamic viscosity	no data available	None known
Explosive properties	no data available	
Oxidizing properties	no data available	

Other Information

Softening Point	no data available
Particle Size	no data available
Particle Size Distribution	

10. STABILITY AND REACTIVITY

Reactivity

no data available.

Chemical stability
Stable under recommended storage conditions.
Possibility of Hazardous Reactions
None under normal processing.
Hazardous Polymerization
Hazardous polymerization does not occur.
Conditions to avoid
None known based on information supplied.
Incompatible materials
None known based on information supplied.
Hazardous Decomposition Products
Carbon oxides.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information	.
Inhalation	May cause allergy or asthma symptoms or breathing difficulties if inhaled. Specific test data for the substance or mixture is not available. May cause sensitization in susceptible persons. (based on components).
Eye contact	Specific test data for the substance or mixture is not available.
Skin contact	Specific test data for the substance or mixture is not available. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons. (based on components).
Ingestion	Specific test data for the substance or mixture is not available. May cause additional affects as listed under "Inhalation".

Component Information

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Potassium Dichromate 7778-50-9	= 25 mg/kg (Rat) = 48 mg/kg (Rat)	= 1150 mg/kg (Rabbit) = 14 mg/kg (Rabbit)	-

Information on toxicological effects

Symptoms Itching. Rashes. Hives. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain, or flushing. Coughing and/ or wheezing.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Sensitization May cause sensitization in susceptible persons. May cause sensitization by skin contact. May cause sensitization by inhalation.

Mutagenic Effects There is no data for this product. Contains a known or suspected mutagen.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA
Potassium Dichromate 7778-50-9	A1	Group 1	Known	X

ACGIH (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
NTP (National Toxicology Program)
Known - Known Carcinogen
OSHA (Occupational Safety and Health Administration of the US Department of Labor)
X - Present

Reproductive toxicity Contains a known or suspected reproductive toxin.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Chronic toxicity No known effect based on information supplied. Prolonged exposure may cause chronic effects. Repeated contact may cause allergic reactions in very susceptible persons. Contains a known or suspected mutagen. Possible risk of irreversible effects. Contains a known or suspected carcinogen. Contains a known or suspected reproductive toxin.

Target Organ Effects Skin. Respiratory system. Eyes. May affect the genetic material in germ cells (sperm and eggs). Gastrointestinal tract (GI). Reproductive system.

Aspiration Hazard No information available.

Numerical measures of toxicity Product Information

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)
40,000.00 mg/kg
ATEmix (inhalation-dust/mist)
20.04 mg/L

12. ECOLOGICAL INFORMATION

Ecotoxicity
Harmful to aquatic life with long lasting effects.

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Potassium Dichromate 7778-50-9		96h LC50: > 139 mg/L (Cyprinus carpio) 96h LC50: 113.6 - 155.7 mg/L (Lepomis macrochirus) 96h LC50: = 320 mg/L (Lepomis macrochirus) 96h LC50: 65.6 - 137.6 mg/L (Lepomis macrochirus) 96h LC50: = 12.3 mg/L (Oncorhynchus mykiss) 96h LC50: 21.209 - 30.046 mg/L (Oryzias latipes) 96h LC50: 15.41 - 30.36 mg/L (Pimephales promelas) 96h LC50: 14 - 20.9 mg/L (Pimephales promelas) 96h LC50: 24.81 - 34.55 mg/L (Poecilia reticulata) 96h LC50: 23 - 41.2 mg/L (Poecilia reticulata) 96h LC50: = 26 mg/L (Morone saxatilis)		

Persistence and Degradability
No information available.
Bioaccumulation
No information available

Other adverse effects
No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal methods This material, as supplied, is not a hazardous waste according to Federal regulations (40 CFR 261). This material could become a hazardous waste if it is mixed with or otherwise comes in contact with a hazardous waste, if chemical additions are made to this material, or if the material is processed or otherwise altered. Consult 40 CFR 261 to determine whether the altered material is a hazardous waste. Consult the appropriate state, regional, or local regulations for additional requirements.

Contaminated Packaging Dispose of contents/containers in accordance with local regulations.

This product contains one or more substances that are listed with the State of California as a hazardous waste.

Chemical Name	California Hazardous Waste
Potassium Dichromate 7778-50-9	Toxic Corrosive Ignitable

14. TRANSPORT INFORMATION

DOT Not regulated
Proper Shipping Name NON REGULATED
Hazard Class N/A

TDG Not regulated

MEX Not regulated

ICAO Not regulated

IATA Not regulated
Proper Shipping Name NON REGULATED
Special Provisions None

IMDG Not regulated
Special Provisions None
Marine Pollutant Not applicable

RID Not regulated
Special Provisions None

ADR Not regulated
Special Provisions None

ADN Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA Complies
DSL All components are listed either on the DSL or NDSL.
ENCS Contact supplier for inventory compliance status
KECL Contact supplier for inventory compliance status
PICCS Contact supplier for inventory compliance status
AICS Contact supplier for inventory compliance status

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical Name	CAS-No	Percent	SARA 313 - Threshold Values %
Potassium Dichromate - 7778-50-9	7778-50-9	0.25	0.1

SARA 311/312 Hazard Categories

Acute Health Hazard Yes
Chronic Health Hazard Yes
Fire Hazard No
Sudden release of pressure hazard No
Reactive Hazard No

CWA (Clean Water Act)

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Potassium Dichromate 7778-50-9	10 lb	X		X

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs	RQ
Potassium Dichromate 7778-50-9	10 lb		RQ 10 lb final RQ RQ 4.54 kg final RQ

US State Regulations

California Proposition 65

This product contains the following Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

.

International Regulations

Component	Carcinogen Status	Exposure Limits
Potassium Dichromate 7778-50-9 (0.25)	A1	Mexico: TWA 0.05 mg/m³ Mexico: TWA 0.5 mg/m³

A1 - Confirmed Human Carcinogen

Canada

WHMIS Hazard Class

Not determined

16. OTHER INFORMATION

NFPA	**Health Hazards** 2	**Flammability** 0	**Instability** 0	**Physical and Chemical Hazards** -
HMIS	**Health Hazards** 2 *	**Flammability** 0	**Physical Hazard** 0	**Personal Protection** X

Chronic Hazard Star Legend * = Chronic Health Hazard

Prepared By Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Revision Date 29-Oct-2015

Revision Note No information available

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

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End of Safety Data Sheet

SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/13/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Indeno[1,2,3-*cd*]pyrene
Product Number	:	48499
Brand	:	Supelco
CAS-No.	:	193-39-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	+1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word	Warning
Hazard statement(s)	
H351	Suspected of causing cancer.
Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_{22}H_{12}$
Molecular weight	:	276.33 g/mol
CAS-No.	:	193-39-5
EC-No.	:	205-893-2

Hazardous components

Component	Classification	Concentration
Indeno[1,2,3-cd]pyrene		
	Carc. 2; H351	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available

d)	pH	No data available
e)	Melting point/freezing point	163.6 °C (326.5 °F)
f)	Initial boiling point and boiling range	536.0 °C (996.8 °F)
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)
IARC:	2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)
NTP:	Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. Indeno[1,2,3-cd]pyrene	CAS-No. 193-39-5	Revision Date 2007-09-28
WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No. 193-39-5	Revision Date 2007-09-28

Indeno[1,2,3-cd]pyrene

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Carc.	Carcinogenicity
H351	Suspected of causing cancer.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 05/27/2016 Print Date: 07/13/2017

Iron Filings, 40 mesh

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : **Iron Filings, 40 mesh**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25369**

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:

Not classified for physical or health hazards under GHS.

Signal word :Warning

Hazard statements:
Precautionary statements:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use
Do not eat, drink or smoke when using this product

Combustible Dust Hazard: :
May form combustible dust concentrations in air (during processing).

Other Non-GHS Classification:

WHMIS
NFPA/HMIS

NFPA SCALE (0-4)

HMIS RATINGS (0-4)

Iron Filings, 40 mesh

SECTION 3 : Composition/information on ingredients

Ingredients:		
CAS 7439-89-6	Iron	100 %
		Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Loosen clothing as necessary and position individual in a comfortable position.Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen.Get medical assistance if cough or other symptoms appear.

After skin contact: Rinse/flush exposed skin gently using soap and water for 15-20 minutes.Seek medical advice if discomfort or irritation persists.

After eye contact: Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned.

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists.Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed:

Irritation, Nausea,Headache, Shortness of breath.;

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician.Physician should treat symptomatically.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition. Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam.

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Combustion products may include carbon oxides or other toxic vapors.Thermal decomposition can lead to release of irritating gases and vapors.

Advice for firefighters:

Protective equipment: Use NIOSH-approved respiratory protection/breathing apparatus.

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible.Use spark-proof tools and explosion-proof equipment.Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols.Avoid contact with skin, eyes, and clothing.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Use spark-proof tools and explosion-proof equipment.Ensure that air-handling systems are operational.Ensure adequate ventilation.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13. Should not be released into environment.

Methods and material for containment and cleaning up:

Keep in suitable closed containers for disposal.Wear protective eyeware, gloves, and clothing. Refer to Section 8.Always obey local regulations.Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter). Evacuate personnel to safe areas.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Minimize dust generation and accumulation. Follow good hygiene procedures when handling chemical materials. Refer to Section 8.Do not eat, drink, smoke, or use personal products when handling chemical substances. Avoid contact with eyes, skin, and clothing.

Conditions for safe storage, including any incompatibilities:

Store away from incompatible materials.Protect from freezing and physical damage.Keep away from food and beverages.Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store in cool, dry conditions in well sealed containers. Store with like hazards

SECTION 8 : Exposure controls/personal protection

Control Parameters: , , OSHA PEL TWA (Total Dust) 15 mg/m3 (50 mppcf*)
, , ACGIH TLV TWA (inhalable particles) 10 mg/m3

Appropriate Engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling.Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment.Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).Use under a fume hood

Respiratory protection: Not required under normal conditions of use. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls.When necessary use NIOSH approved breathing equipment.

Protection of skin: Select glove material impermeable and resistant to the substance.Select glove material based on rates of diffusion and degradation.Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves.Wear protective clothing.

Eye protection: Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).Safety glasses or goggles are appropriate eye protection.

General hygienic measures: Perform routine housekeeping.Wash hands before breaks and at the end of work.Avoid contact with skin, eyes, and clothing.Before wearing wash contaminated clothing.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	Solid	**Explosion limit lower**: **Explosion limit upper**:	Not determined Not determined
Odor:	Not Determined	**Vapor pressure**:	Not determined
Odor threshold:	Not determined	**Vapor density**:	Not determined
pH-value:	Not Determined	**Relative density**:	Not determined
Melting/Freezing point:	Not determined	**Solubilities**:	
Boiling point/Boiling range:	Not determined	**Partition coefficient (n-octanol/water)**:	Not determined
Flash point (closed cup):	Not determined	**Auto/Self-ignition temperature**:	Not determined
Evaporation rate:	Not determined	**Decomposition temperature**:	Not determined
Flammability (solid,gaseous):	Not determined	**Viscosity**:	a. Kinematic:Not determined b. Dynamic: Not determined
Density: Not determined			

SECTION 10 : Stability and reactivity

Reactivity: Nonreactive under normal conditions.
Chemical stability: Stable under normal conditions.
Possible hazardous reactions: None under normal processing
Conditions to avoid: Incompatible Materials.
Incompatible materials: Strong acids.Strong bases.Oxidizing agents.
Hazardous decomposition products:

SECTION 11 : Toxicological information

Acute Toxicity: No additional information.	
Chronic Toxicity: No additional information.	
Corrosion Irritation: No additional information.	
Sensitization:	No additional information.
Single Target Organ (STOT):	No additional information.
Numerical Measures:	No additional information.

Iron Filings, 40 mesh

Carcinogenicity:	No additional information.
Mutagenicity:	No additional information.
Reproductive Toxicity:	No additional information.

SECTION 12 : Ecological information

Ecotoxicity Persistence and degradability:
Bioaccumulative potential:
Mobility in soil:
Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Contact a licensed professional waste disposal service to dispose of this material.Dispose of empty containers as unused product.Product or containers must not be disposed with household garbage.It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11).Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

SECTION 14 : Transport information

UN-Number

Not Regulated.

UN proper shipping name

Not Regulated.

Transport hazard class(es)
Packing group:Not Regulated
Environmental hazard:
Transport in bulk:
Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

None of the ingredients is listed

SARA Section 313 (Specific toxic chemical listings):

None of the ingredients is listed

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

None of the ingredients is listed

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

None of the ingredients is listed

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.Note:. The responsibility to provide a safe workplace remains with the user.The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate.However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material.It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
DNEL: Derived No-Effect Level (REACH)
PNEC: Predicted No-Effect Concentration (REACH)
CFR: Code of Federal Regulations (USA)
SARA: Superfund Amendments and Reauthorization Act (USA)
RCRA: Resource Conservation and Recovery Act (USA)
TSCA: Toxic Substances Control Act (USA)
NPRI: National Pollutant Release Inventory (Canada)
DOT: US Department of Transportation

Effective date : 10.24.2014
Last updated : 03.23.2015

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

SDS # : 001031

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers

CAS number : 115-11-7

Product code : 001031

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	**ACGIH TLV (United States, 3/2015).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 56.12 g/mole

Molecular formula : C4-H8

Boiling/condensation point : -6.9°C (19.6°F)

Melting/freezing point : -140.7°C (-221.3°F)

Critical temperature : 144.75°C (292.6°F)

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -76.1°C (-105°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.6845

Gas Density (lb/ft ^{3}) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.263 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

SADT : Not available.

Section 9. Physical and chemical properties

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Isobutylene	2.34	-	low

Section 12. Ecological information

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1	2.1	2.1	2.1	2.1
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 29	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 14. Transport information

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Isobutylene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : This material is listed or exempted.

Malaysia : Not determined.

Section 15. Regulatory information

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)

Health	1
Flammability	4
Physical hazards	2

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Flam. Gas 1, H220 Press. Gas Liq. Gas, H280	Expert judgment Expert judgment

History

Date of printing : 7/11/2016

Date of issue/Date of revision : 7/11/2016

Date of previous issue : No previous validation

Section 16. Other information

Version : 0.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 12-Sep-2014 **Revision Date** 12-Dec-2014 **Revision Number** 1

1. Identification

Product Name **Lead**

Cat No. : **L27-1RL**

Synonyms Lead metal.

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Emergency Telephone Number
Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 4
Carcinogenicity	Category 1B
Reproductive Toxicity	Category 1A
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Harmful if swallowed
Harmful if inhaled
May cause drowsiness or dizziness
May cause cancer
May damage the unborn child. Suspected of damaging fertility
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
Other hazards
WARNING! This product contains a chemical known in the State of California to cause cancer. WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Lead	7439-92-1	> 99

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes.

Inhalation Move to fresh air.

Ingestion Do not induce vomiting.

Most important symptoms/effects No information available.
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point No information available

Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
None known
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up No information available.

7. Handling and storage

Handling Wear personal protective equipment. Ensure adequate ventilation.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Lead	TWA: 0.05 mg/m³	TWA: 50 µg/m³	IDLH: 100 mg/m³ TWA: 0.050 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Lead	TWA: 0.05 mg/m³	TWA: 0.15 mg/m³	TWA: 0.05 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment
Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	Light blue
Odor	Odorless
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	327.4 °C / 621.3 °F
Boiling Point/Range	1740 °C / 3164 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1.3 mmHg @ 970 °C
Vapor Density	No information available
Relative Density	11.3
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Pb
Molecular Weight	207.19

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products.
Incompatible Materials	Strong oxidizing agents
Hazardous Decomposition Products	None under normal use conditions
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Component Information

Toxicologically Synergistic Products	No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	No information available
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Lead	7439-92-1	Group 2B	Reasonably Anticipated	A3	X	A3

IARC: (International Agency for Research on Cancer)
IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)
NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens
Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Kidney Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

(Bad file name)

Ecotoxicity

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Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Lead	Not listed	1.32 mg/L LC50 96 h 1.17 mg/L LC50 96 h 0.44 mg/L LC50 96 h	Not listed	600 µg/L EC50 = 48 h

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Lead	X	X	-	231-100-4	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Lead	7439-92-1	> 99	0.1

SARA 311/312 Hazardous Categorization

Acute Health Hazard Yes
Chronic Health Hazard Yes
Fire Hazard No
Sudden Release of Pressure Hazard No
Reactive Hazard No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Lead	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Lead	X		-

OSHA Occupational Safety and Health Administration
Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Lead	30 µg/m³ Action Level 50 µg/m³ TWA	-

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Lead	10 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Lead	7439-92-1	Carcinogen Developmental Female Reproductive Male Reproductive	15 µg/day	Developmental Carcinogen

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Lead	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class D2A Very toxic materials
D1B Toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 12-Sep-2014
Revision Date 12-Dec-2014
Print Date 12-Dec-2014
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

SAFETY DATA SHEET

Creation Date 17-Jan-2011 **Revision Date** 03-Aug-2015 **Revision Number** 3

1. Identification

Product Name **Magnesium**

Cat No. : **AC191080000; AC191080025; AC191080100; AC191085000**

Synonyms Magnesium metal (ribbons/turnings)

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids	Category 1
Self-heating substances and mixtures	Category 2
Substances/mixtures which, in contact with water, emit flammable gases	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
Self-heating in large quantities; may catch fire
In contact with water releases flammable gas

Precautionary Statements
Prevention
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool. Protect from sunlight
Keep away from any possible contact with water, because of violent reaction and possible flash fire
Handle under inert gas. Protect from moisture
Skin
Brush off loose particles from skin. Immerse in cool water/wrap with wet bandages
Fire
In case of fire: Use CO_2, dry chemical, or foam for extinction
Storage
Maintain air gap between stacks/pallets
Store away from other materials
Store in a dry place. Store in a closed container
Store bulk masses at temperatures not exceeding manufacturer recommendations
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
May form combustible dust concentrations in air

3. Composition / information on ingredients

Component	CAS-No	Weight %
Magnesium	7439-95-4	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation Remove from exposure, lie down. Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration.

Ingestion Do not induce vomiting. Get medical attention.

Most important symptoms/effects No information available.
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Dry chemical. approved class D extinguishers. clay. sodium carbonate. Do not use a solid water stream as it may scatter and spread fire.

Unsuitable Extinguishing Media No information available

Flash Point 500 °C / 932 °F
Method - No information available

Autoignition Temperature 472.8 °C / 883 °F
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Dust can form an explosive mixture in air. Water reactive. Produce flammable gases on contact with water. Flammable.

Hazardous Combustion Products
Magnesium oxides
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
0	4	2	W

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition.

Environmental Precautions See Section 12 for additional ecological information.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation. Remove all sources of ignition. Ground and bond containers when transferring material. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Avoid contact with skin and eyes. Do not breathe dust. Use explosion-proof equipment. Use only non-sparking tools. Wash hands before breaks and immediately after handling the product. Ensure adequate ventilation. Wear personal protective equipment. Avoid dust formation.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Never allow product to get in contact with water during storage. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Measures Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	7
Melting Point/Range	651 °C / 1203.8 °F
Boiling Point/Range	1107 °C / 2024.6 °F
Flash Point	500 °C / 932 °F
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	negligible
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	472.8 °C / 883 °F
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Mg
Molecular Weight	24.3

10. Stability and reactivity

Reactive Hazard Yes

Stability Stable under normal conditions. Air sensitive. Water reactive.

Conditions to Avoid Protect from water. Exposure to air. Incompatible products. Exposure to moist air or water.

Incompatible Materials Acids, Strong oxidizing agents, Halogens, Acid chlorides

Hazardous Decomposition Products Magnesium oxides

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Magnesium	230 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation May cause irritation

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Magnesium	7439-95-4	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects	No information available
Reproductive Effects	No information available.
Developmental Effects	No information available.
Teratogenicity	No information available.
STOT - single exposure	None known
STOT - repeated exposure	None known
Aspiration hazard	No information available
Symptoms / effects,both acute and delayed	No information available
Endocrine Disruptor Information	No information available
Other Adverse Effects	See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Do not empty into drains.

Persistence and Degradability	Insoluble in water
Bioaccumulation/ Accumulation	No information available.
Mobility	Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods	Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1869
Proper Shipping Name	MAGNESIUM
Hazard Class	4.1
Packing Group	III

TDG

UN-No	UN1869
Proper Shipping Name	MAGNESIUM
Hazard Class	4.1
Packing Group	III

IATA

UN-No	UN1869
Proper Shipping Name	MAGNESIUM
Hazard Class	4.1
Packing Group	III

IMDG/IMO

UN-No	UN1869
Proper Shipping Name	MAGNESIUM
Hazard Class	4.1
Packing Group	III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Magnesium	X	X	-	231-104-6	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazardous Categorization

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

Clean Water Act Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Magnesium	X	X	X	-	X

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class	B6 Reactive flammable material B4 Flammable solid F Dangerously reactive material

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	17-Jan-2011
Revision Date	03-Aug-2015
Print Date	03-Aug-2015
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

SAFETY DATA SHEET

Version 4.6
Revision Date 10/09/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Manganese
Product Number	:	266167
Brand	:	Aldrich
CAS-No.	:	7439-96-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram	none
Signal word	none
Hazard statement(s)	
H401	Toxic to aquatic life.
Precautionary statement(s)	
P273	Avoid release to the environment.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Mn
Molecular weight	:	54.94 g/mol
CAS-No.	:	7439-96-5
EC-No.	:	231-105-1

Hazardous components

Component	Classification	Concentration
Manganese		
	Aquatic Acute 2; H401	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Manganese/manganese oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.

Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Moisture sensitive. Handle and store under inert gas.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Manganese	7439-96-5	TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC)		
		C	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		C	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) varies		
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2015 Adoption varies		

		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2015 Adoption varies		
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment varies		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment varies		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: chips Colour: grey, brown, silver
b)	Odour	odourless
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 1,244 °C (2,271 °F) - lit.
f)	Initial boiling point and boiling range	1,962 °C (3,564 °F) - lit.
g)	Flash point	Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available

j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	7.3 g/mL at 25 °C (77 °F)
n)	Water solubility	0.0007 g/l at 20 °C (68 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Avoid moisture.

10.5 Incompatible materials
acids, Halogens, Bases, Phosphorus, Sulphur oxides, Hydrogen peroxide, Oxidizing agents, Nitric acid, Sodium Hydroxide, Carbon dioxide (CO2), Nitryl Flouride, Steam

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - > 2,000 mg/kg
(OECD Test Guideline 420)

LC50 Inhalation - Rat - male and female - 4 h - > 5.14 mg/l
(OECD Test Guideline 403)

Dermal: No data available

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation - 72 h
(OECD Test Guideline 405)

Respiratory or skin sensitisation
- Mouse
Result: Does not cause skin sensitisation.
(OECD Test Guideline 429)

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	semi-static test NOEC - Oncorhynchus mykiss (rainbow trout) - 3.6 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	Immobilization NOEC - Daphnia magna (Water flea) - 1.6 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	Growth inhibition EC50 - Desmodesmus subspicatus (Scenedesmus subspicatus) - 4.5 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	Respiration inhibition EC50 - Sludge Treatment - 1,000 mg/l - 3 h (OECD Test Guideline 209)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.6 Revision Date: 10/09/2015 Print Date: 05/01/2016

Safety Data Sheet
Mercury (Metallic)

SDS Revision Date: **05/01/2015**

1. Identification

1.1. Product identifier

Product Identity	Mercury (Metallic)
Alternate Names	Quicksilver; Hydrargyrum; Liquid Silver

1.2. Relevant identified uses of the substance or mixture and uses advised against

Intended use	See Technical Data Sheet.
Application Method	See Technical Data Sheet.

1.3. Details of the supplier of the safety data sheet

Company Name	WM Mercury Waste Inc. 21211 Durand Avenue Union Grove, WI 53182
Emergency	
CHEMTREC (USA)	(800) 424-9300
Customer Service: WM Mercury Waste Inc.	(800) 741-3343

2. Hazard(s) identification

2.1. Classification of the substance or mixture

Acute Tox. 2;H330	Fatal if inhaled.
Repr. 1B;H360D	May damage the unborn child.
STOT RE 1;H372	Causes damage to organs through prolonged or repeated exposure. Specific Target Organs: (Central Nervous System)
Aquatic Chronic 1;H410	Very toxic to aquatic life with long lasting effects.

2.2. Label elements

Using the Toxicity Data listed in section 11 and 12 the product is labeled as follows.

Danger

H330 Fatal if inhaled.
H360D May damage the unborn child.
H372 Causes damage to organs through prolonged or repeated exposure.
H410 Very toxic to aquatic life with long lasting effects.

[Prevention]:
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe mist / vapors / spray.
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P284 Wear respiratory protection.
[Response]:
P304+340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P308+313 IF exposed or concerned: Get medical advice / attention.
P310 Immediately call a POISON CENTER or doctor / physician.
P314 Get Medical advice / attention if you feel unwell.
P320 Specific treatment is urgent (see information on this label).
P391 Collect spillage.
[Storage]:
P403+233 Store in a well ventilated place. Keep container tightly closed.
P405 Store locked up.
[Disposal]:
P501 Dispose of contents / container in accordance with local / national regulations.

3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the relevant State and Federal Hazardous Substances regulations.

Ingredient/Chemical Designations	Weight %	GHS Classification	Notes
Mercury **CAS Number: 0007439-97-6**	**100**	**Repr. 1B;H360D** **Acute tox. 2;H330** **STOT RE 1;H372** **Aquatic Acute 1;H400** **Aquatic Chronic 1;H410**	**[1][2]**

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.
[1] Substance classified with a health or environmental hazard.
[2] Substance with a workplace exposure limit.
[3] PBT-substance or vPvB-substance.
*The full texts of the phrases are shown in Section 16.

4. First aid measures

4.1. Description of first aid measures

General	In all cases of doubt, or when symptoms persist, seek medical attention. Never give anything by mouth to an unconscious person.
Inhalation	Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious place in the recovery position and obtain immediate medical attention. Give nothing by mouth.
Eyes	Irrigate copiously with clean water for at least 15 minutes, holding the eyelids apart and seek medical attention.
Skin	Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser.
Ingestion	If swallowed, wash out mouth with water, obtain immediate medical attention. Keep at rest. Do NOT induce vomiting.

4.2. Most important symptoms and effects, both acute and delayed

Overview	**Eye:** Contact with eyes may cause severe irritation, and possible eye burns. Vapors may cause eye irritation. **Skin:** May cause skin irritation. May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes. **Ingestion:** May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure. **Inhalation:** Causes respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. May cause severe respiratory tract irritation. **Chronic:** Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes. **Notes to Physician:** Treat symptomatically and supportively. **Antidote:** The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel. The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. See section 2 for further details.
Inhalation	Fatal if inhaled.

5. Fire-fighting measures

5.1. Extinguishing media

Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition: Mercury/mercury oxides.

Do not breathe mist / vapors / spray.

5.3. Advice for fire-fighters

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.

ERG Guide No. 172

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Put on appropriate personal protective equipment (see section 8).

6.2. Environmental precautions

Do not allow spills to enter drains or waterways.

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

6.3. Methods and material for containment and cleaning up

Vacuum or sweep up material and place into a suitable disposal container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section).

7. Handling and storage

7.1. Precautions for safe handling

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

See section 2 for further details. - [Prevention]:

7.2. Conditions for safe storage, including any incompatibilities

Handle containers carefully to prevent damage and spillage.

Incompatible materials: Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Poison room locked.

See section 2 for further details. - [Storage]:

7.3. Specific end use(s)

No data available.

8. Exposure controls and personal protection

8.1. Control parameters

Exposure

CAS No.	Ingredient	Source	Value
0007439-97-6	Mercury	OSHA	TWA 0.1 mg/m3
		ACGIH	Alkyl compounds TWA: 0.01 mg/m3 STEL 0.03 mg/m3 Skin Aryl compounds TWA: 0.05 mg/m3 C 0.1 mg/m3 Skin Elemental/Inorganic 0.025mg/m3 Skin
		NIOSH	No Established Limit
		Supplier	No Established Limit

Carcinogen Data

CAS No.	Ingredient	Source	Value
0007439-97-6	Mercury	OSHA	Select Carcinogen: No
		NTP	Known: No; Suspected: No
		IARC	Group 1: No; Group 2a: No; Group 2b: No; Group 3: Yes; Group 4: No;

8.2. Exposure controls

Respiratory Follow the OSHA respirator regulations found in 29CFR §1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Eyes Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin Wear appropriate protective clothing to prevent skin exposure. Wear appropriate gloves to prevent skin exposure.

Engineering Controls Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and any vapor below occupational exposure limits suitable respiratory protection must be worn.

Other Work Practices Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details. - [Prevention]:

9. Physical and chemical properties

Appearance	Silver Liquid
Odor	Odorless
Odor threshold	Not Measured
pH	Not Applicable
Melting point / freezing point	-38.87 deg C

SDS Revision Date: **05/01/2015**

Initial boiling point and boiling range	356.5 deg C @ 760.00mmHg
Flash Point	Not Measured
Evaporation rate (Ether = 1)	Not Available
Flammability (solid, gas)	Not Applicable
Upper/lower flammability or explosive limits	**Lower Explosive Limit:** Not Measured **Upper Explosive Limit:** Not Measured
Vapor pressure (Pa)	0.002 mmHg @ 25C
Vapor Density	7 (Air=1)
Specific Gravity	13.5400g/cm3 (Water=1)
Solubility in Water	Insoluble
Partition coefficient n-octanol/water (Log Kow)	Not Measured
Auto-ignition temperature	Not Measured
Decomposition temperature	Not Available
Viscosity (cSt)	1.554 cP 20.00
Molecular Formula	Hg
Molecular Weight	200.59

9.2. Other information

No other relevant information.

10. Stability and reactivity

10.1. Reactivity

Hazardous Polymerization will not occur.

10.2. Chemical stability

Stable under normal circumstances.

10.3. Possibility of hazardous reactions

No data available.

10.4. Conditions to avoid

High temperatures, incompatible materials, metals.

10.5. Incompatible materials

Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

10.6. Hazardous decomposition products

Mercury/mercury oxides.

11. Toxicological information

Acute toxicity

Ingredient	Oral LD50, mg/kg	Skin LD50, mg/kg	Inhalation Vapor LC50, mg/L/4hr	Inhalation Dust/Mist LC50, mg/L/4hr	Inhalation Gas LC50, ppm

Mercury - (7439-97-6)	37.00, Rat - Category: 2	No data available	No data available	No data available	No data available

Note: When no route specific LD50 data is available for an acute toxin, the converted acute toxicity point estimate was used in the calculation of the product's ATE (Acute Toxicity Estimate).

Classification	Category	Hazard Description
Acute toxicity (oral)	2	Fatal if swallowed.
Acute toxicity (dermal)	---	Not Applicable
Acute toxicity (inhalation)	2	Fatal if inhaled.
Skin corrosion/irritation	---	Not Applicable
Serious eye damage/irritation	---	Not Applicable
Respiratory sensitization	---	Not Applicable
Skin sensitization	---	Not Applicable
Germ cell mutagenicity	---	Not Applicable
Carcinogenicity	---	Not Applicable
Reproductive toxicity	1B	May damage the unborn child.
STOT-single exposure	---	Not Applicable
STOT-repeated exposure	1	Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard	---	Not Applicable

12. Ecological information

12.1. Toxicity

Very toxic to aquatic life with long lasting effects.

No additional information provided for this product. See Section 3 for chemical specific data.

Aquatic Ecotoxicity

Ingredient	96 hr LC50 fish, mg/l	48 hr EC50 crustacea, mg/l	ErC50 algae, mg/l
Mercury - (7439-97-6)	Not Available	0.0052, Daphnia magna	Not Available

12.2. Persistence and degradability

There is no data available on the preparation itself.

12.3. Bioaccumulative potential

Not Measured

12.4. Mobility in soil

No data available.

12.5. Results of PBT and vPvB assessment

This product contains no PBT/vPvB chemicals.

12.6. Other adverse effects

No data available.

13. Disposal considerations

13.1. Waste treatment methods

Observe all federal, state and local regulations when disposing of this substance.

14. Transport information

	DOT (Domestic Surface Transportation)	IMO / IMDG (Ocean Transportation)	ICAO/IATA
14.1. UN number	UN2809	UN2809	UN2809
14.2. UN proper shipping name	UN2809, Mercury, 8, III	Mercury	Mercury
14.3. Transport hazard class(es)	**DOT Hazard Class:** 8 (6.1)	**IMDG:** 8 **Sub Class:** 6.1	**Air Class:** 8
14.4. Packing group	III	III	III

14.5. Environmental hazards

IMDG Marine Pollutant: Yes (Mercury)

14.6. Special precautions for user

No further information

15. Regulatory information

Regulatory Overview The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented.

Toxic Substance Control Act (TSCA) All components of this material are either listed or exempt from listing on the TSCA Inventory.

WHMIS Classification D1A

US EPA Tier II Hazards

Fire: No
Sudden Release of Pressure: No
Reactive: No
Immediate (Acute): Yes
Delayed (Chronic): Yes

EPCRA 311/312 Chemicals and RQs (lbs):

Mercury (1.00)

EPCRA 302 Extremely Hazardous:

To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

SDS Revision Date: **05/01/2015**

EPCRA 313 Toxic Chemicals:

Mercury

Proposition 65 - Carcinogens (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

Proposition 65 - Developmental Toxins (>0.0%):
Mercury

Proposition 65 - Female Repro Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

Proposition 65 - Male Repro Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

New Jersey RTK Substances (>1%):

Mercury

Pennsylvania RTK Substances (>1%):

Mercury

16. Other information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:

H330 Fatal if inhaled.

H360D May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H400 Very toxic to aquatic life.

H410 Very toxic to aquatic life with long lasting effects.

This is the first version in the GHS SDS format. Listings of changes from previous versions in other formats are not applicable.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall WM Mercury Waste Inc. be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages.

End of Document

Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

SDS No. 8957
US GHS

Synonyms: Valvoline Product Code 52670413

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Skin Corrosion/Irritation – Category 2
Specific Target Organ Toxicity – Category 3 (narcosis)
Carcinogenicity - Category 1B

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

WARNING

Hazard Statements

Causes skin irritation.
May cause cancer.
May cause drowsiness or dizziness.

Precautionary Statements

Prevention

Wash hands and forearms thoroughly after handling.
Wear protective gloves/protective clothing/eye protection.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.

Response

If on skin: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
If exposed or concerned: Get medical advice/attention.
If inhaled: Remove person to fresh air and keep in a position comfortable for breathing. Call poison center or doctor if you feel unwell.

Storage

Store locked up.
Store in a well-ventilated place.
Keep container tightly closed.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
64742-65-0	Petroleum distillates, solvent dewaxed heavy paraffinic	83-93

Petroleum-based lubricating oil with detergent/dispersant engine oil package with zinc compounds.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is visual difficulty, seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

First Aid: Ingestion

Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

First Aid: Notes to Physician

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard. Patients who aspirate these oils should be followed for the development of long-term sequelae. Repeated aspiration of mineral oil can produce chronic inflammation of the lungs (i.e. lipoid pneumonia) that may progress to pulmonary fibrosis. Symptoms are often subtle and radiological changes appear worse than clinical abnormalities. Occasionally, persistent cough, irritation of the upper respiratory tract, shortness of breath with exertion, fever, and bloody sputum occur. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities. Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. No special fire hazards are known to be associated with this product. Dense smoke may be generated while burning.

Hazardous Combustion Products

May form: carbon dioxide and carbon monoxide, oxides of sulfur, nitrogen and phosphorous, various hydrocarbons.

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

SMALL SPILL: Absorb liquid on vermiculite, floor absorbent or other absorbent material. Persons not wearing proper personal protective equipment should be excluded from area of spill.

LARGE SPILL: Prevent run-off to sewers, streams, or other bodies of water. If run-off occurs, notify authorities as required, that a spill has occurred. Persons not wearing proper personal protective equipment should be excluded from area of spill until clean-up has been completed.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Avoid contact with: acids, halogens, strong oxidizing agents.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

ACGIH, OSHA, and NIOSH have not developed exposure limits for any of this product's components.

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Not normally required. However, wear resistant gloves such as nitrile rubber to prevent irritation which may result from prolonged or repeated skin contact with product.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

To prevent repeated or prolonged skin contact, wear impervious clothing and boots. Wear normal work clothing covering arms and legs.

Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Dry, clear and bright	**Odor:**	None
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	ND	**Vapor Density:**	ND
Boiling Point:	>425 °F (218.3°C) @ 760.00 mmHg	**Melting Point:**	ND
Solubility (H2O):	Negligible	**Specific Gravity:**	0.881 @ 60°F (16°C)
Evaporation Rate:	Slower than ethyl ether	**VOC:**	ND
Viscosity:	<= 3300.0 cps @ -20°C; 10.0 - 11.0 cst @ 100°C	**Octanol/H2O Coeff.:**	ND
Flash Point:	430 °F (221.1 °C)	**Flash Point Method:**	COC
Upper Flammability Limit (UFL):	ND	**Lower Flammability Limit (LFL):**	ND
Burning Rate:	ND	**Auto Ignition:**	ND

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

None

Incompatible Products

Avoid contact with: acids, halogens, strong oxidizing agents.

Hazardous Decomposition Products

May form: aldehydes, carbon dioxide and carbon monoxide, hydrogen sulfide, oxides of sulfur, nitrogen and phosphorus, toxic fumes, various hydrocarbons.

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if large amounts are swallowed.

B: Component Analysis - LD50/LC50

Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)

Inhalation LC50 Rat >4.7 mg/L 4 h; Oral LD50 Rat >5000 mg/kg; Dermal LD50 Rabbit >5000 mg/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

May cause mild skin irritation. Prolonged or repeated contact may dry the skin. Symptoms include redness, burning, drying and cracking of the skin, and skin burns. Additional symptoms of skin contact include: acne. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

May cause mild eye irritation. Symptoms include stinging, tearing, and redness.

Potential Health Effects: Ingestion

Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

Potential Health Effects: Inhalation

It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms usually occur at air concentrations higher than the recommended exposure limits.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product is not reported to have any mutagenic effects.

Carcinogenicity

A: General Product Information

May cause cancer.

Used motor oil has been shown to cause skin cancer in laboratory animal continually exposed by repeated applications.

B: Component Carcinogenicity

None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

Aspiration Respiratory Organs Hazard

Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)

Test & Species		Conditions
96 Hr LC50 Oncorhynchus mykiss	>5000 mg/L	
48 Hr EC50 Daphnia magna	>1000 mg/L	

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

DOT Information

Shipping Name: Not Regulated

* * * Section 15 - Regulatory Information * * *

Regulatory Information

Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	--	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

ZINC C1-C14 ALKYLDITHIOPHOSPHATE (CAS No. 68649-42-3)

State Regulations

Component Analysis - State

None of this product's components are listed on the state lists from CA, MA, MN, NJ, PA, or RI.

Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

Additional Regulatory Information

Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Petroleum distillates, solvent dewaxed heavy paraffinic	64742-65-0	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	1
Fire	1
Reactivity	0

HMIS® Hazard Rating

Health	1*	Slight
Fire	1	Slight
Physical	0	Minimal
		*Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

SAFETY DATA SHEET

Version 5.5
Revision Date 05/27/2016
Print Date 07/13/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Methyl *tert*-butyl ether
Product Number	:	48027
Brand	:	Supelco
Index-No.	:	603-181-00-X
CAS-No.	:	1634-04-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	+1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word	Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H315	Causes skin irritation.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves/ eye protection/ face protection.

P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	MTBE *tert*-Butyl methyl ether Methyl *tert*-butyl ether
Formula	:	$C_5H_{12}O$
Molecular weight	:	88.15 g/mol
CAS-No.	:	1634-04-4
EC-No.	:	216-653-1
Index-No.	:	603-181-00-X
Registration number	:	01-2119452786-27-XXXX

Hazardous components

Component	Classification	Concentration
tert-Butyl methyl ether		
	Flam. Liq. 2; Skin Irrit. 2; H225, H315	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
tert-Butyl methyl ether	1634-04-4	TWA	50.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Kidney damage Confirmed animal carcinogen with unknown relevance to humans		
		PEL	40 ppm 144 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 230 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Impervious clothing, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -108.6 °C (-163.5 °F)
f)	Initial boiling point and boiling range	55 - 56 °C (131 - 133 °F) - lit.
g)	Flash point	-33.0 °C (-27.4 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 15.1 %(V) Lower explosion limit: 1.6 %(V)
k)	Vapour pressure	1,018.7 hPa (764.1 mmHg) at 55.0 °C (131.0 °F) 279.2 hPa (209.4 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.74 g/cm3 at 25 °C (77 °F)

n)	Water solubility	42 g/l at 20 °C (68 °F) - OECD Test Guideline 105
o)	Partition coefficient: n-octanol/water	log Pow: 1.06
p)	Auto-ignition temperature	374.0 °C (705.2 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	0.464 mm2/s at 20 °C (68 °F) - 0.409 mm2/s at 40 °C (104 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Oxidizing agents, Strong acids

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 4,000 mg/kg

LC50 Inhalation - Rat - 4 h - 23576 ppm

Dermal: No data available

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation

Respiratory or skin sensitisation
Will not occur

Germ cell mutagenicity
No data available

Carcinogenicity

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KN5250000

Nausea, Vomiting, Dizziness, Central nervous system depression, Aspiration or inhalation may cause chemical pneumonitis., MTBE (methyl-tert-butyl ether) is reported to metabolize to tert-butyl alcohol and formaldehyde by microsomal demethylation, MTBE (methyl-tert-butyl ether) should be considered a "potential human carcinogen" due to an increase in leydig interstitial cell tumors of testes in male rats and an increase in lymphomas, leukemias, and uterine sarcomas in female rats., In another unpublished study MTBE was shown to be carcinogenic due to "increased incidence of a rare type of kidney tumor" in male rats and an "increase in the incidence of hepatocellular adenomas" in female mice., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 672.00 mg/l - 96 h
	LC50 - other fish - > 1,000.00 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 472 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 491 mg/l - 96 h

12.2 Persistence and degradability

Biodegradability	Result: 0 % - Not readily biodegradable. (OECD Test Guideline 301D)

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 2398 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHYL tert-BUTYL ETHER

IATA
UN number: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
tert-Butyl methyl ether	1634-04-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
tert-Butyl methyl ether	1634-04-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
tert-Butyl methyl ether	1634-04-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
tert-Butyl methyl ether	1634-04-4	2007-07-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H315	Causes skin irritation.
Skin Irrit.	Skin irritation

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	0

NFPA Rating
Health hazard: 2

Fire Hazard:	3
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 05/27/2016 Print Date: 07/13/2017

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 27-Sep-2010 **Revision Date** 12-Oct-2015 **Revision Number** 3

1. Identification

Product Name **Naphthalene**

Cat No. : **N7-500**

Synonyms Tar camphor; Naphthalin; Coal tar camphor

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Emergency Telephone Number
Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids	Category 2
Acute oral toxicity	Category 4
Carcinogenicity	Category 1B
Target Organs - Liver, Kidney.	

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
Harmful if swallowed
May cause cancer

Precautionary Statements
Prevention

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Fire
In case of fire: Use CO_2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Naphthalene	91-20-3	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms/effects . Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

Unsuitable Extinguishing Media No information available

Flash Point 78 °C / 172.4 °F
Method - No information available

Autoignition Temperature Not applicable 526 °C / 978.8 °F
Explosion Limits
Upper 5.9 vol %
Lower 0.9 vol %
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Combustible material. Containers may explode when heated. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	2	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal. Remove all sources of ignition.

7. Handling and storage

Handling Wear personal protective equipment. Ensure adequate ventilation. Avoid ingestion and inhalation. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Naphthalene	TWA: 10 ppm Skin	(Vacated) TWA: 10 ppm (Vacated) TWA: 50 mg/m³ (Vacated) STEL: 15 ppm (Vacated) STEL: 75 mg/m³ TWA: 10 ppm TWA: 50 mg/m³	IDLH: 250 ppm TWA: 10 ppm TWA: 50 mg/m³ STEL: 15 ppm STEL: 75 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Naphthalene	TWA: 10 ppm TWA: 52 mg/m³ STEL: 15 ppm STEL: 79 mg/m³	TWA: 10 ppm TWA: 50 mg/m³ STEL: 15 ppm STEL: 75 mg/m³	TWA: 10 ppm STEL: 15 ppm Skin

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	White
Odor	Characteristic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	79 - 82 °C / 174.2 - 179.6 °F
Boiling Point/Range	218 °C / 424.4 °F
Flash Point	78 °C / 172.4 °F
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	5.9 vol %
Lower	0.9 vol %
Vapor Pressure	0.08 mbar @ 20 °C
Vapor Density	Not applicable
Specific Gravity	0.990
Solubility	slightly soluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable 526 °C / 978.8 °F
Decomposition Temperature	540 °C
Viscosity	Not applicable
Molecular Formula	C10H8
Molecular Weight	128.17

10. Stability and reactivity

Reactive Hazard Yes

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Naphthalene	LD50 = 490 mg/kg (Rat) LD50 = 1110 mg/kg (Rat)	LD50 > 20 g/kg (Rabbit) LD50 = 1120 mg/kg (Rabbit)	LC50 > 340 mg/m^3 (Rat) 1 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Naphthalene	91-20-3	Group 2B	Reasonably Anticipated	A3	X	Not listed

IARC: (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans
NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects Developmental effects have occurred in experimental animals.

Teratogenicity Teratogenic effects have occurred in experimental animals.

STOT - single exposure None known
STOT - repeated exposure Liver Kidney

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Naphthalene	EC50: = 0.4 mg/L, 72h (Skeletonema costatum)	LC50 96 h 1-6.5 mg/L (Pimephales promelas)	EC50 = 0.93 mg/L 30 min EC50 > 20 mg/L 18 h	EC50: 1.09 - 3.4 mg/L, 48h Static (Daphnia magna) EC50: = 1.96 mg/L, 48h Flow through (Daphnia magna) LC50: = 2.16 mg/L, 48h (Daphnia magna)

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.
Bioaccumulation/ Accumulation No information available.

Mobility . Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Naphthalene	3.3

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Naphthalene - 91-20-3	U165	-

14. Transport information

DOT
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

TDG
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

IATA
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

IMDG/IMO
- **UN-No** UN1334
- **Proper Shipping Name** NAPHTHALENE, CRUDE
- **Hazard Class** 4.1
- **Packing Group** III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Naphthalene	X	X	-	202-049-5	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b)

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Naphthalene	91-20-3	>95	0.1

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Naphthalene	X	100 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Naphthalene	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Naphthalene	100 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Naphthalene	91-20-3	Carcinogen	5.8 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Naphthalene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Moderate risk, Grade 2

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
B3 Combustible liquid
D1B Toxic materials
D2A Very toxic materials

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 27-Sep-2010
Revision Date 12-Oct-2015
Print Date 12-Oct-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

SAFETY DATA SHEET

Version 4.7
Revision Date 12/28/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Nickel
Product Number	:	268259
Brand	:	Aldrich
Index-No.	:	028-002-00-7
CAS-No.	:	7440-02-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and

	understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Ni
Molecular weight	:	58.69 g/mol
CAS-No.	:	7440-02-0
EC-No.	:	231-111-4
Index-No.	:	028-002-00-7

Hazardous components

Component	Classification	Concentration
Nickel		
	Skin Sens. 1; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; H317, H351, H372, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Nickel/nickel oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Nickel	7440-02-0	TWA	1.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Dermatitis Pneumoconiosis Not suspected as a human carcinogen		
		TWA	1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.015000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

		TWA	1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.015000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	1.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Dermatitis Pneumoconiosis Not suspected as a human carcinogen		
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.015 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Foil Colour: white, silver, metallic
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 1,453 °C (2,647 °F) - lit.
f)	Initial boiling point and boiling range	2,732 °C (4,950 °F) - lit.
g)	Flash point	Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	1 hPa (1 mmHg) at 1,810 °C (3,290 °F)
l)	Vapour density	No data available
m)	Relative density	8.9 g/mL at 25 °C (77 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
acids, Oxidizing agents, Sulphur compounds, Hydrogen gas, Oxygen, Methanol, organic solvents, Aluminium, Fluorine, Ammonia

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
May cause sensitisation by skin contact.

Germ cell mutagenicity
No data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Nickel)
	1 - Group 1: Carcinogenic to humans (Nickel)
	2B - Group 2B: Possibly carcinogenic to humans (Nickel)
IARC:	2B - Group 2B: Possibly carcinogenic to humans (Nickel)
	1 - Group 1: Carcinogenic to humans (Nickel)
	2B - Group 2B: Possibly carcinogenic to humans (Nickel)
NTP:	Reasonably anticipated to be a human carcinogen (Nickel)
	Reasonably anticipated to be a human carcinogen (Nickel)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Inhalation - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

Additional Information
RTECS: QR5950000

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Cyprinus carpio (Carp) - 1.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1 mg/l - 48 h

12.2 Persistence and degradability
Not applicable

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Nickel	7440-02-0	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Nickel	7440-02-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Nickel	7440-02-0	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Nickel	7440-02-0	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Nickel	7440-02-0	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7 Revision Date: 12/28/2015 Print Date: 05/01/2016

SAFETY DATA SHEET

Creation Date 10-Dec-2009 **Revision Date** 26-May-2017 **Revision Number** 4

1. Identification

Product Name **Tetrachloroethylene**

Cat No. : **AC445690000; ACR445690010; AC445690025; AC445691000**

Synonyms Perchloroethylene

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Skin Sensitization	Category 1
Carcinogenicity	Category 1B
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Tetrachloroethylene	127-18-4	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Ingestion Clean mouth with water and drink afterwards plenty of water.

Most important symptoms/effects None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

Hazardous Combustion Products
Chlorine Hydrogen chloride gas Phosgene
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation.
Environmental Precautions Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Tetrachloroethylene	TWA: 25 ppm STEL: 100 ppm	(Vacated) TWA: 25 ppm (Vacated) TWA: 170 mg/m^3 Ceiling: 200 ppm TWA: 100 ppm	IDLH: 150 ppm	TWA: 100 ppm TWA: 670 mg/m^3 TWA: 200 ppm TWA: 1250 mg/m^3 STEL: 200 ppm STEL: 1340 mg/m^3

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic, sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-22 °C / -7.6 °F
Boiling Point/Range	120 - 122 °C / 248 - 251.6 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	6.0 (Ether = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	18 mbar @ 20 °C
Vapor Density	No information available
Density	1.619
Specific Gravity	1.625
Solubility	0.15 g/L water (20°C)
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	> 150°C
Viscosity	0.89 mPa s at 20 °C
Molecular Formula	C2 Cl4
Molecular Weight	165.83

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Exposure to moist air or water.

Incompatible Materials Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines, Aluminium

Hazardous Decomposition Products Chlorine, Hydrogen chloride gas, Phosgene

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetrachloroethylene	LD50 = 2629 mg/kg (Rat)	LD50 > 10000 mg/kg (Rat)	LC50 = 27.8 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Tetrachloroethylene	127-18-4	Group 2A	Reasonably Anticipated	A3	X	A3

IARC: (International Agency for Research on Cancer)
IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)
NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens
Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Kidney Liver Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest

pain, muscle pain or flushing

Endocrine Disruptor Information

Component	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Tetrachloroethylene	Group II Chemical	Not applicable	Not applicable

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Tetrachloroethylene	EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata)	LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus) LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas) LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 100 mg/L 24 h EC50 = 112 mg/L 24 h EC50 = 120.0 mg/L 30 min	EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

Component	log Pow
Tetrachloroethylene	2.88

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Tetrachloroethylene - 127-18-4	U210	-

14. Transport information

DOT

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

TDG

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IATA

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1

Packing Group III

IMDG/IMO

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Subsidiary Hazard Class P
Packing Group III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Tetrachloroethylene	X	X	-	204-825-9	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Tetrachloroethylene	127-18-4	>95	0.1

SARA 311/312 Hazard Categories

Acute Health Hazard Yes
Chronic Health Hazard Yes
Fire Hazard No
Sudden Release of Pressure Hazard No
Reactive Hazard No

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Tetrachloroethylene	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Tetrachloroethylene	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Tetrachloroethylene	100 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Tetrachloroethylene	127-18-4	Carcinogen	14 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Tetrachloroethylene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 10-Dec-2009
Revision Date 26-May-2017
Print Date 26-May-2017
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Section 1. Identification

CHS Inc.
P.O. Box 64089
Mail station 525
St. Paul, MN 55164-0089

Transportation Emergency (CHEMTREC) : **1-800-424-9300**
Technical Information : **1-651-355-8443**
SDS Information : **1-651-355-8445**

Product name	:	Regular, Midgrade & Premium Unleaded Gasoline	**SDS no.**	:	0147- M6A0
Common name	:	Unleaded Gasoline, Premium Unleaded Gasoline	**Revision date**	:	11/15/2013
Chemical name	:	Light Petroleum Distillate	**Chemical formula**	:	Mixture
Chemical family	:	Mixed Petroleum Hydrocarbon			

Relevant identified uses of the substance or mixture and uses advised against

Not available.

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture :
FLAMMABLE LIQUIDS - Category 1
SKIN CORROSION/IRRITATION - Category 2
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1A
TOXIC TO REPRODUCTION (Fertility) - Category 2
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1
ASPIRATION HAZARD - Category 1
AQUATIC HAZARD (ACUTE) - Category 3
AQUATIC HAZARD (LONG-TERM) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements :
Extremely flammable liquid and vapor.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May be fatal if swallowed and enters airways.
May cause drowsiness and dizziness.
Causes damage to organs through prolonged or repeated exposure.
Harmful to aquatic life with long lasting effects.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Hazardous Material Information System (U.S.A.)	**Health :**	2 *	**Flammability :**	4	**Physical hazards :**	0	
National Fire Protection Association (U.S.A.)	**Health :**	2	**Flammability :**	4	**Instability :**	0	

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Chemical name : Light Petroleum Distillate

Other means of identification : Unleaded Gasoline, Premium Unleaded Gasoline

Ingredient name	%	CAS number
Toluene	10 - 30	108-88-3
Xylene	10 - 30	1330-20-7
Tert-butyl methyl ether	10 - 30	1634-04-4
Benzene	1 - 5	71-43-2
1,2,4-Trimethylbenzene	1 - 5	95-63-6
Ethylbenzene	1 - 5	100-41-4
n-Hexane	1 - 5	110-54-3
Butyl ethyl ether	0.1 - 1	628-81-9
Naphthalene	0.1 - 1	91-20-3

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : If material comes in contact with the eyes, immediately wash the eyes with large amounts of water for 15 minutes, occasionally lifting the lower and upper lids. Get medical attention.

Inhalation : If person breathes in large amounts of material, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the person warm and at rest. Get medical attention as soon as possible.

Skin contact : If the material comes in contact with the skin, wash the contaminated skin with soap and water promptly. If the material penetrates through clothing, remove the clothing and wash the skin with soap and water promptly. If irritation persists after washing, get medical attention immediately.

Ingestion : If material has been swallowed, do not induce vomiting. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness.

Skin contact : Causes skin irritation.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following: pain or irritation, watering, redness.

Inhalation : Adverse symptoms may include the following: respiratory tract irritation, coughing.

Skin contact : Adverse symptoms may include the following: irritation, redness.

Ingestion : No known significant effects or critical hazards.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet or water-based fire extinguishers.

Specific hazards arising from the chemical : Highly volatile material. Flowing gasoline can be ignited by self-generated static electricity; containers should be bonded and grounded. Vapors may travel along the ground to a source of ignition (pilot light, heater, electric motor) some distance away. Containers, drums (even empty) can explode when heat (welding, cutting, etc.) is applied.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Water may be ineffective on flames, but should be used to keep fire-exposed containers cool. Large fires, such as tank fires, should be fought with caution. If possible, pump the contents from the tank and keep adjoining structures cool and protect personnel. Avoid spreading burning liquid with water used for cooling purposes. Do not flush down public sewers. The use of a self-contained breathing apparatus and protective clothing is recommended for fire fighters. Avoid inhalation of vapors.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Keep unnecessary and unprotected personnel from entering. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Methods and materials for containment and cleaning up

Spill : Contain with dikes or absorbent to prevent migration to sewers/streams. Take up small spill with dry chemical absorbent; large spills may require pump or vacuum prior to absorbent. May require excavation of severely contaminated soil.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking.

Conditions for safe storage, including any incompatibilities : Do not store above the following temperature: 113°C (235.4°F). Odorous and toxic fumes may form from the decomposition of this product if stored at excessive temperatures for extended periods of time. Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Toluene	**NIOSH REL (United States, 6/2009).** STEL: 560 mg/m³ 15 minutes. STEL: 150 ppm 15 minutes. TWA: 375 mg/m³ 10 hours. TWA: 100 ppm 10 hours. **OSHA PEL Z2 (United States, 11/2006).** AMP: 500 ppm 10 minutes. CEIL: 300 ppm TWA: 200 ppm 8 hours. **ACGIH TLV (United States, 3/2012).** TWA: 20 ppm 8 hours.
Xylene	**ACGIH TLV (United States, 3/2012).** STEL: 651 mg/m³ 15 minutes. STEL: 150 ppm 15 minutes. TWA: 434 mg/m³ 8 hours. TWA: 100 ppm 8 hours. **OSHA PEL (United States, 6/2010).** TWA: 100 ppm 8 hours.

	TWA: 435 mg/m³ 8 hours.
Tert-butyl methyl ether	**ACGIH TLV (United States, 1/2005).** TWA: 50 ppm 8 hours. Form: All forms. **ACGIH TLV (United States, 2/2010).** TWA: 50 ppm 8 hours.
Benzene	**ACGIH TLV (United States, 3/2012). Absorbed through skin.** STEL: 8 mg/m³ 15 minutes. STEL: 2.5 ppm 15 minutes. TWA: 1.6 mg/m³ 8 hours. TWA: 0.5 ppm 8 hours. **NIOSH REL (United States, 6/2009).** STEL: 1 ppm 15 minutes. TWA: 0.1 ppm 10 hours. **OSHA PEL (United States, 6/2010).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL Z2 (United States, 11/2006).** AMP: 50 ppm 10 minutes. CEIL: 25 ppm TWA: 10 ppm 8 hours.
1,2,4-Trimethylbenzene	**ACGIH TLV (United States, 3/2012).** TWA: 123 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **NIOSH REL (United States, 1/2013).** TWA: 125 mg/m³ 10 hours. TWA: 25 ppm 10 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 25 ppm 8 hours. TWA: 125 mg/m³ 8 hours.
Ethylbenzene	**ACGIH TLV (United States, 3/2012).** TWA: 20 ppm 8 hours. **NIOSH REL (United States, 6/2009).** STEL: 545 mg/m³ 15 minutes. STEL: 125 ppm 15 minutes. TWA: 435 mg/m³ 10 hours. TWA: 100 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 435 mg/m³ 8 hours. TWA: 100 ppm 8 hours.
n-Hexane	**ACGIH TLV (United States, 3/2012). Absorbed through skin.** TWA: 50 ppm 8 hours. **NIOSH REL (United States, 6/2009).** TWA: 180 mg/m³ 10 hours. TWA: 50 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 1800 mg/m³ 8 hours. TWA: 500 ppm 8 hours.
Naphthalene	**ACGIH TLV (United States, 3/2012). Absorbed through skin.** STEL: 79 mg/m³ 15 minutes. STEL: 15 ppm 15 minutes. TWA: 52 mg/m³ 8 hours. TWA: 10 ppm 8 hours. **NIOSH REL (United States, 1/2013).** STEL: 75 mg/m³ 15 minutes. STEL: 15 ppm 15 minutes. TWA: 50 mg/m³ 10 hours. TWA: 10 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 50 mg/m³ 8 hours. TWA: 10 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Recommended: Splash goggles and a face shield, where splash hazard exists.

Skin protection

Hand protection : 4 - 8 hours (breakthrough time): Nitrile gloves.

Body protection : Recommended: Long sleeved coveralls.

Other skin protection : Recommended: Impervious boots.

Respiratory protection : If ventilation is inadequate, use a NIOSH-certified respirator with an organic vapor cartridge and P95 particulate filter.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid.

Color : Reddish golden brown.

Odor : Gasoline

Odor threshold : 10 ppm

pH : Not available.

Melting point : Not available.

Boiling point : 26.66°C (80°F)

Flash point : Closed cup: -40°C (-40°F) [Pensky-Martens.]

Flammability : Not available.

Lower and upper explosive (flammable) limits : Lower: 1.4% Upper: 7.6%

Relative density : 0.72

Evaporation rate : Slower.

Solubility : Insoluble in the following materials: cold water and hot water.

Solubility in water : Negligible.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : 257.22 to 454.44°C (495 to 850°F)

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not available.

Vapor pressure : 53.3 kPa (400 mm Hg) (68°F)

Vapor density : 4 [Air = 1]

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Toluene	LC50 Inhalation Vapor	Rat	49 g/m³	4 hours
	LD50 Oral	Rat	636 mg/kg	-
Xylene	LC50 Inhalation Gas.	Rat	5000 ppm	4 hours
	LD50 Oral	Rat	4300 mg/kg	-
Tert-butyl methyl ether	LC50 Inhalation Gas.	Rat	23576 ppm	4 hours
	LC50 Inhalation Vapor	Rat	41000 mg/m³	4 hours
	LD50 Oral	Rat	>4 g/kg	-
Benzene	LD50 Oral	Rat	930 mg/kg	-
1,2,4-Trimethylbenzene	LC50 Inhalation Vapor	Rat	18000 mg/m³	4 hours
	LD50 Oral	Rat	5 g/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	3500 mg/kg	-
n-Hexane	LC50 Inhalation Gas.	Rat	48000 ppm	4 hours
	LD50 Oral	Rat	15840 mg/kg	-
Butyl ethyl ether	LD50 Oral	Rat	1870 mg/kg	-
Naphthalene	LD50 Dermal	Rabbit	>20 g/kg	-
	LD50 Oral	Rat	490 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Toluene	Eyes - Mild irritant	Rabbit	-	0.5 minutes 100 mg	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 mg	-
	Eyes - Mild irritant	Rabbit	-	870 µg	-
	Eyes - Severe irritant	Rabbit	-	24 hours 2 mg	-
	Skin - Mild irritant	Pig	-	24 hours 250 µL	-
	Skin - Mild irritant	Rabbit	-	435 mg	-
	Skin - Moderate irritant	Rabbit	-	500 mg	-
Xylene	Eyes - Mild irritant	Rabbit	-	87 mg	-
	Eyes - Severe irritant	Rabbit	-	24 hours 5 mg	-
	Skin - Mild irritant	Rat	-	8 hours 60 µL	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 mg	-
	Skin - Moderate irritant	Rabbit	-	100%	-
Benzene	Eyes - Moderate irritant	Rabbit	-	88 mg	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 mg	-
	Eyes - Severe irritant	Rabbit	-	24 hours 2 mg	-
	Skin - Mild irritant	Rat	-	8 hours 60 µL	-
	Skin - Mild irritant	Rabbit	-	24 hours 15 mg	-
Ethylbenzene	Eyes - Severe irritant	Rabbit	-	500 mg	-
	Skin - Mild irritant	Rabbit	-	24 hours 15 mg	-
n-Hexane	Eyes - Mild irritant	Rabbit	-	10 mg	-
Naphthalene	Skin - Mild irritant	Rabbit	-	495 mg	-
	Skin - Severe irritant	Rabbit	-	24 hours 0.05 mL	-

Sensitization

Skin : There is no data available.

Respiratory : There is no data available.

Mutagenicity

There is no data available.

Carcinogenicity

There is no data available.

Classification

Product/ingredient name	OSHA	IARC	NTP
Toluene	-	3	-
Xylene	-	3	-
Tert-butyl methyl ether	-	3	-
Benzene	+	1	Known to be a human carcinogen.
Ethylbenzene	-	2B	-
Naphthalene	-	2B	Reasonably anticipated to be a human carcinogen.

Reproductive toxicity

There is no data available.

Teratogenicity

There is no data available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Toluene	Category 3	Not applicable.	Narcotic effects
1,2,4-Trimethylbenzene	Category 3	Not applicable.	Respiratory tract irritation
n-Hexane	Category 3	Not applicable.	Narcotic effects

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Toluene	Category 2	Not determined	Not determined
Benzene	Category 1	Not determined	Not determined
n-Hexane	Category 2	Not determined	Not determined

Aspiration hazard

Name	Result
Toluene	ASPIRATION HAZARD - Category 1
Benzene	ASPIRATION HAZARD - Category 1
n-Hexane	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Toluene	Acute EC50 433 ppm Marine water	Algae - Skeletonema costatum	96 hours
	Acute EC50 12500 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 11600 µg/l Fresh water	Crustaceans - Gammarus pseudolimnaeus - Adult	48 hours
	Acute EC50 6000 µg/l Fresh water	Daphnia - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling)	48 hours
	Acute LC50 5500 µg/l Fresh water	Fish - Oncorhynchus kisutch - Fry	96 hours
	Chronic NOEC 500000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Daphnia - Daphnia magna	21 days
Xylene	Acute IC50 10 mg/L	Algae	72 hours
	Acute LC50 8500 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 13400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
Tert-butyl methyl ether	Acute LC50 672000 µg/l Fresh water	Fish - Pimephales promelas	96 hours
Benzene	Acute EC50 29000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 1360000 µg/l Fresh water	Algae - Scenedesmus abundans	96 hours
	Acute EC50 9230 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 21000 µg/l Marine water	Crustaceans - Artemia salina - Nauplii	48 hours
	Acute LC50 5.28 ul/L Fresh water	Fish - Oncorhynchus gorbuscha - Fry	96 hours
	Chronic NOEC 1.5 to 5.4 ul/L Marine water	Fish - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling)	4 weeks
1,2,4-Trimethylbenzene	Acute LC50 4910 µg/l Marine water	Crustaceans - Elasmopus pectenicrus - Adult	48 hours
	Acute LC50 22.4 mg/L Fresh water	Fish - Tilapia zillii	96 hours
Ethylbenzene	Acute EC50 4600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 3600 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
	Acute EC50 2970 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 5200 µg/l Marine water	Crustaceans - Americamysis bahia	48 hours
	Acute LC50 4200 µg/l Fresh water	Fish - Oncorhynchus mykiss	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	96 hours
n-Hexane	Acute LC50 113000 µg/l Fresh water	Fish - Oreochromis mossambicus	96 hours
Naphthalene	Acute EC50 1600 µg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 2350 µg/l Marine water	Crustaceans - Palaemonetes pugio	48 hours
	Acute LC50 213 µg/l Fresh water	Fish - Melanotaenia fluviatilis - Larvae	96 hours

Persistence and degradability

There is no data available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Toluene	2.73	90	low
Xylene	3.12	8.1 to 25.9	low
Tert-butyl methyl ether	1.04	1.5	low
Benzene	2.13	11	low
1,2,4-Trimethylbenzene	3.63	243	low
Ethylbenzene	3.6	-	low
n-Hexane	4	501.187	high
Butyl ethyl ether	2.03	-	low
Naphthalene	3.4	36.5 to 168	low

Mobility in soil

Soil/water partition coefficient (K_{oc}) : There is no data available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

Section 14. Transport information

DOT IDENTIFICATION NUMBER UN1203 **DOT proper shipping name** GASOLINE (Toluene, Xylene) RQ (Benzene, Xylene)

DOT Hazard Class(es) 3 **PG** I **DOT EMER. RESPONSE GUIDE NO.** 128

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) PAIR**: Naphthalene
TSCA 8(a) CDR Exempt/Partial exemption: Not determined
United States inventory (TSCA 8b): All components are listed or exempted.
Clean Water Act (CWA) 307: Toluene; Benzene; Ethylbenzene; Naphthalene
Clean Water Act (CWA) 311: Toluene; Xylene; Benzene; Ethylbenzene; Naphthalene

Clean Air Act Section 602 Class I Substances : Not listed
Clean Air Act Section 602 Class II Substances : Not listed
DEA List I Chemicals (Precursor Chemicals) : Not listed
DEA List II Chemicals (Essential Chemicals) : Listed
Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Toluene	10 - 30	Yes.	No.	No.	Yes.	Yes.
Xylene	10 - 30	Yes.	No.	No.	Yes.	No.
Tert-butyl methyl ether	10 - 30	Yes.	No.	No.	Yes.	No.
Benzene	1 - 5	Yes.	No.	No.	Yes.	Yes.
1,2,4-Trimethylbenzene	1 - 5	Yes.	No.	No.	Yes.	No.
Ethylbenzene	1 - 5	Yes.	No.	No.	Yes.	Yes.
n-Hexane	1 - 5	Yes.	No.	No.	Yes.	Yes.
Butyl ethyl ether	0.1 - 1	Yes.	No.	No.	Yes.	No.
Naphthalene	0.1 - 1	No.	No.	No.	Yes.	Yes.

SARA 313 : This product (does/not) contain toxic chemicals subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

Product name	CAS number	%
Toluene	108-88-3	Up to 18.1
Xylene	1330-20-7	Up to 15.3
Benzene	71-43-2	Up to 5.3
1,2,4-Trimethylbenzene	95-63-6	Up to 4.8
Ethylbenzene	100-41-4	Up to 2.6
n-Hexane	110-54-3	Up to 4
Naphthalene	91-20-3	Up to 1

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2, 4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether

New York : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; Ethylbenzene; n-Hexane; Naphthalene

New Jersey : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2, 4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether; Naphthalene

Pennsylvania : The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2, 4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether; Naphthalene

California Prop. 65 : **WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Toluene	No.	Yes.	No.	7000 µg/day (ingestion) 13000 µg/day (inhalation)
Benzene	Yes.	Yes.	6.4 µg/day (ingestion) 13 µg/day (inhalation)	24 µg/day (ingestion) 49 µg/day (inhalation)
Ethylbenzene	Yes.	No.	41 µg/day (ingestion) 54 µg/day (inhalation)	No.
Naphthalene	Yes.	No.	Yes.	No.

Section 16. Other information

Revision date : 11/15/2013

Revised Section(s) : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.

Supersedes : 01/23/2013

Prepared by : KMK Regulatory Services Inc.

Notice to reader

THE INFORMATION CONTAINED IN THIS SDS RELATES ONLY TO THE SPECIFIC MATERIAL IDENTIFIED. IT DOES NOT COVER USE OF THAT MATERIAL IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY PARTICULAR PROCESS. IN COMPLIANCE WITH 29 C.F.R. 1910.1200(g), CHS HAS PREPARED THIS SDS IN SEGMENTS, WITH THE INTENT THAT THOSE SEGMENTS BE READ TOGETHER AS A WHOLE WITHOUT TEXTUAL OMISSIONS OR ALTERATIONS. CHS BELIEVES THE INFORMATION CONTAINED HEREIN TO BE ACCURATE, BUT MAKES NO REPRESENTATION, GUARANTEE, OR WARRANTY, EXPRESS OR IMPLIED, ABOUT THE ACCURACY, RELIABILITY, OR COMPLETENESS OF THE INFORMATION OR ABOUT THE FITNESS OF CONTENTS HEREIN FOR EITHER GENERAL OR PARTICULAR PURPOSES. PERSONS REVIEWING THIS SDS SHOULD MAKE THEIR OWN DETERMINATION AS TO THE MATERIAL'S SUITABILITY AND COMPLETENESS FOR USE IN THEIR PARTICULAR APPLICATIONS.

RegenOx® – Part A (Oxidizer Complex)

Material Safety Data Sheet (MSDS)

Last Revised: June 24, 2010

Section 1 – Supplier Information and Material Identification

Supplier:

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H_2O_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.
Chemical Family:	Inorganic Chemicals
Trade Name:	RegenOx® – Part A (Oxidizer Complex)
Product Use:	Used to remediate contaminated soil and groundwater (environmental applications)

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical	Percentage
15630-89-4	Sodium Percarbonate	60 -100 %
5968-11-6	Sodium Carbonate Monohydrate	10 – 30 %
7699-11-6	Silicic Acid	< 1 %
63231-67-4	Silica Gel	< 1 %

Section 3 – Physical Data

Form:	Powder
Color:	White
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA

Section 3 – Physical Data (cont)

Flammability/Flash Point:	NA
Vapor Pressure:	NA
Bulk Density:	0.9 – 1.2 g/cm^3
Solubility:	Min 14.5g/100g water @ 20 ºC
Viscosity:	NA
pH (3% solution):	≈ 10.5
Decomposition Temperature:	Self-accelerating decomposition with oxygen release starts at 50 ºC.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions
Conditions to Avoid/Incompatibility:	Acids, bases, salts of heavy metals, reducing agents, and flammable substances
Hazardous Decomposition Products:	Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam.

Section 5 – Regulations

TSCA Inventory Listed:	Yes
CERCLA Hazardous Substance (40 CFR Part 302)	
Listed Substance:	*No*
Unlisted Substance:	*Yes*
SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know	
Extremely Hazardous Substance:	No
WHMIS Classification:	C, D2B
Canadian Domestic Substance List:	Appears

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:

Oxidizer. Store in a cool, well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 ˚C.

Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.

Protect from moisture. Do not store near combustible materials. Keep containers well sealed.

Store separately from reducing materials. Avoid contamination which may lead to decomposition.

Handling:

Avoid contact with eyes, skin and clothing. Use with adequate ventilation.

Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area.

Label containers and keep them tightly closed when not in use.

Wash hands thoroughly after handling.

Personal Protective Equipment (PPE)

Engineering Controls:

General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis.

Respiratory Protection:

For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used.

Hand Protection:

Wear chemical resistant gloves (neoprene, rubber, or PVC).

Section 6 – Protective Measures, Storage and Handling (cont)

Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use.
Other:	Eye wash station.
Protection Against Fire & Explosion:	Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes slight irritation.
Ingestion:	May be harmful if swallowed (vomiting and diarrhea).

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage:	Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.
Extinguishing Media:	Water

First Aid

Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **Do Not** induce vomiting.

Section 8 – Measures in Case of Accidents and Fire (cont)

Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water.

Section 9 – Accidental Release Measures

Precautions:	
Cleanup Methods:	Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.

Section 10 – Information on Toxicology

Toxicity Data	
LD50 Oral (rat):	2,400 mg/kg
LD50 Dermal (rabbit):	Min 2,000 mg/kg
LD50 Inhalation (rat):	Min 4,580 mg/kg

Section 11 – Information on Ecology

Ecology Data	
Ecotoxicological Information:	NA

Section 12 – Disposal Considerations

Waste Disposal Method	
Waste Treatment:	Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations.
Package (Pail) Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T. Shipping Name:	Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H2O_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.]
UN Number:	1479
Hazard Class:	5.1
Labels:	5.1 (Oxidizer)
Packaging Group:	III

Section 14 – Other Information

HMIS® Rating	Health – 1 (slight)	Reactivity – 1 (slight)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat

HMIS® is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

RegenOx® – Part B (Activator Complex)

Material Safety Data Sheet (MSDS)

Last Revised: June 4, 2010

Section 1 – Supplier Information and Material Identification

Supplier:

REGENESIS

1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of sodium silicate solution, silica gel and ferrous sulfate
Chemical Family:	Inorganic Chemicals
Trade Name:	RegenOx® – Part B (Activator Complex)
Product Use:	Used for environmental remediation of contaminated soils and groundwater

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical
1344-09-8	Silicic Acid, Sodium Salt, Sodium Silicate
63231-67-4	Silica Gel
7720-78-7	Ferrous Sulfate
7732-18-5	Water

Section 3 – Physical Data

Form:	Liquid
Color:	Blue/Green
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA
Flammability/Flash Point:	NA
Vapor Pressure:	NA

Section 3 – Physical Data (cont)

Specific Gravity	1.39 g/cm^3
Solubility:	Miscible
Viscosity:	NA
pH (3% solution):	11
Hazardous Decomposition Products:	Oxides of carbon and silicon may be formed when heated to decomposition.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions.
Conditions to Avoid:	None.
Incompatibility:	Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers.

Section 5 – Regulations

TSCA Inventory Listed:	Yes

CERCLA Hazardous Substance (40 CFR Part 302)

Listed Substance:	*No*
Unlisted Substance:	*Yes*

SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification

Extremely Hazardous Substance:	No

SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know

Hazard Category:	Acute

SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know

Extremely Hazardous Substance:	No

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:	Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat above 60 degrees C and colder than 10 degrees C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers.
Handling:	Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation. Do not use product if it is brownish-yellow in color.

Personal Protective Equipment (PPE)

Engineering Controls:	General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access.
Respiratory Protection:	Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134.
Hand Protection:	Wear chemical resistant gloves.
Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use.
Other:	
Protection Against Fire & Explosion:	Product is non-explosive and non-combustible.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes irritation. Symptoms include redness, itching and pain.
Ingestion:	May cause irritation to mouth, esophagus, and stomach.

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage (small):	Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations.
After Spillage/Leakage (large):	Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water.
Extinguishing Media:	Material is compatible with all extinguishing media.
Further Information:	

First Aid

Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **DO NOT** induce vomiting.
Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes.

Section 9 – Accidental Release Measures

Precautions:

PPE:	Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6).
Environmental Hazards:	Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material.
Cleanup Methods:	Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Section 10 – Information on Toxicology

Toxicity Data

Sodium Silicate:	When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist. The acute oral toxicity of this product has not been tested.
Ferrous Sulfate:	LD50 Oral (rat): 319 mg/kg not a suspected carcinogen.

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information:	Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L.

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment:	Neutralize and landfill solids in an approved waste facility operated by an authorized contactor in compliance with local regulations.
Package (Pail) Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T.	This product is not regulated as a hazardous material so there are no restrictions.

Section 14 – Other Information

HMIS® Rating	Health – 2 (moderate)	Reactivity – 0 (none)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat
	Contact – 1 (slight)	

HMIS® is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

SAFETY DATA SHEET

Revision Date 26-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Selenium**

Cat No. : **AC419270000; AC419271000; AC419275000**

CAS No 7782-49-2
Synonyms None

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 3
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Specific target organ toxicity - (repeated exposure)	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
May cause damage to organs through prolonged or repeated exposure
Toxic if swallowed or if inhaled

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
May cause long lasting harmful effects to aquatic life

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Selenium	7782-49-2	> 99.5

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and effects None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature Not applicable
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Dust can form an explosive mixture with air.

Hazardous Combustion Products
None known.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance.

Storage. Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep under nitrogen. Incompatible Materials. Acids. Strong oxidizing agents. Fluorine. oxygen. Metals.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Selenium	TWA: 0.2 mg/m³	(Vacated) TWA: 0.2 mg/m³	IDLH: 1 mg/m³ TWA: 0.2 mg/m³	TWA: 0.2 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection A NIOSH/MSHA approved air purifying dust or mist respirator or European Standard EN 149.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid Granules
Appearance	Dark grey
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	217 - 222 °C / 422.6 - 431.6 °F
Boiling Point/Range	685 °C / 1265 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mmHg @ 345 °C
Vapor Density	Not applicable
Specific Gravity	4.810
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Se
Molecular Weight	78.96

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Acids, Strong oxidizing agents, Fluorine, oxygen, Metals

Hazardous Decomposition Products None under normal use conditions

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Selenium	LD50 = 6700 mg/kg (Rat)	Not listed	>5.67 mg/l (Rat) 4hr

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Selenium	7782-49-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

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Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Selenium	Not listed	LC50: > 100 mg/L, 96h semi-static (Oncorhynchus mykiss)	Not listed	Not listed

Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN3283
Hazard Class	6.1
Packing Group	III

TDG

UN-No	UN3283
Hazard Class	6.1
Packing Group	III

IATA

UN-No	UN3283
Proper Shipping Name	SELENIUM COMPOUND, SOLID, N.O.S.
Hazard Class	6.1
Packing Group	III

IMDG/IMO

UN-No	UN3283
Proper Shipping Name	SELENIUM COMPOUND, SOLID, N.O.S.
Hazard Class	6.1
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Selenium	7782-49-2	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Selenium	7782-49-2	X	-	231-957-4	X	X		X	X	KE-30924

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Selenium	7782-49-2	> 99.5	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Selenium	-	-	X	X

Clean Air Act

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Selenium	100 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Selenium	X	X	X	X	X

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Selenium	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Selenium	7782-49-2	Not applicable	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Selenium	7782-49-2	Not applicable	Not applicable	Not applicable	Annex I - Y25

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 26-Dec-2021
Print Date 26-Dec-2021

Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

SILVER

Section 1. Identification

GHS product identifier	:	SILVER
Chemical name	:	Mixture
CAS number	:	Mixture
Other means of identification	:	CC01054908
Product type	:	liquid

Relevant identified uses of the substance or mixture and uses advised against

Product use	:	Industrial applications. Plastics.
Supplier's details	:	**POLYONE CORPORATION** ColorMatrix Group Inc. 680 North Rocky River Drive, Berea, Ohio, 44017-1628, USA +1 216 622 0100
Emergency telephone number (with hours of operation)	:	**CHEMTREC 1-800-424-9300 (24hrs for spill, leak, fire, exposure or accident).**

Section 2. Hazards identification

This mixture has not been evaluated as a whole for health effects. Information provided on health effects of this product is based on the individual components. However, some vapors or contaminants may be released upon heating and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respiratory protection, etc.) to protect employees from exposure. See sections 8 and 11 for special precautions. After handling, always wash hands thoroughly with soap and water.

OSHA/HCS status	:	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	:	SKIN CORROSION/IRRITATION - Category 2

GHS label elements

Hazard pictograms :

Signal word : Warning
Hazard statements : Causes skin irritation.

Precautionary statements

General : Not applicable.
Prevention : Wear protective gloves. Wash hands thoroughly after handling.
Response : IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention.
Storage : Not applicable.
Disposal : Not applicable.
Supplemental label elements : None known.
Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture
Chemical name : Mixture
Other means of identification : CC01054908

CAS number/other identifiers

Ingredient name	%	CAS number
Miscellaneous Compounds Distillates, petroleum, hydrotreated middle	10 - 30	Not available.
Titanium dioxide	10 - 30	13463-67-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	:	Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
Inhalation	:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Skin contact	:	Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	:	Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	:	Causes serious eye irritation.
Inhalation	:	No known significant effects or critical hazards.
Skin contact	:	Causes skin irritation.
Ingestion	:	Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact	:	Adverse symptoms may include the following: pain or irritation

		watering redness
Inhalation	:	No specific data.
Skin contact	:	Adverse symptoms may include the following: irritation redness
Ingestion	:	No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	:	Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	:	No specific treatment.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	:	In case of fire, use water spray (fog), foam, dry chemical or CO_2.
Unsuitable extinguishing media	:	None known.
Specific hazards arising from the chemical	:	In a fire or if heated, a pressure increase will occur and the container may burst.
Hazardous thermal decomposition products	:	Decomposition products may include the following materials: carbon dioxide carbon monoxide metal oxide/oxides
Special protective actions for fire-fighters	:	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Titanium dioxide	**OSHA PEL 1989 (1989-03-01)** PEL: Permissible Exposure Level 10 mg/m3 Form: Total dust **OSHA PEL (1993-06-30)** PEL: Permissible Exposure Level 15 mg/m3 Form: Total dust **ACGIH TLV (1996-05-18)** TLV-TWA: Threshold Limit Value - Time weighted average PEL: Permissible Exposure Level 10 mg/m3

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated

clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : liquid [liquid]
Color : SILVER
Odor : Faint odor.
Odor threshold : Not available.
pH : Not available.
Melting point : Not available.
Boiling point : Not available.
Flash point : Not available.
Burning time : Not available.

Burning rate	:	Not available.
Evaporation rate	:	Not available.
Flammability (solid, gas)	:	Not available.
Lower and upper explosive (flammable) limits	:	**Lower:** Not available. **Upper:** Not available.
Vapor pressure	:	Not available.
Vapor density	:	Not available.
Relative density	:	Not available.
Solubility	:	Not available.
Solubility in water	:	insoluble in water.
Partition coefficient: n-octanol/water	:	Not available.
Auto-ignition temperature	:	Not available.
Decomposition temperature	:	Not available.
SADT	:	Not available.
Viscosity	:	**Dynamic:** Not available. **Kinematic:** Not available.

Section 10. Stability and reactivity

Reactivity	:	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	:	Stable under recommended storage and handling conditions (see Section 7).
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	Keep away from extreme heat and oxidizing agents.
Incompatible materials	:	Keep away from strong acids. Oxidizer.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

This mixture has not been evaluated as a whole for health effects. Exposure effects listed are based on existing health data for the individual components which comprise the mixture.

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Titanium dioxide				

	LC50 Inhalation	Rat - Male	6.82 Mg/l	4 h
	LD50 Dermal	Rabbit	> 5,000 mg/kg	-

Conclusion/Summary : Mixture.Not fully tested.

Irritation/Corrosion

Conclusion/Summary
Skin : Mixture.Not fully tested.
Eyes : Mixture.Not fully tested.
Respiratory : Mixture.Not fully tested.

Sensitization

Conclusion/Summary
Skin : Mixture.Not fully tested.
Respiratory : Mixture.Not fully tested.

Mutagenicity

Conclusion/Summary : Mixture.Not fully tested.

Carcinogenicity

Conclusion/Summary : Mixture.Not fully tested.

Classification

Product/ingredient name	OSHA	IARC	NTP
Titanium dioxide		2B	

Reproductive toxicity

Conclusion/Summary : Mixture.Not fully tested.

Teratogenicity

Conclusion/Summary : Mixture.Not fully tested.

Specific target organ toxicity (single exposure)
Not available.

Specific target organ toxicity (repeated exposure)
Not available.

Aspiration hazard

Product/ingredient name	Result

Miscellaneous Compounds Distillates, petroleum, hydrotreated middle	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.
Inhalation : No known significant effects or critical hazards.
Skin contact : Causes skin irritation.
Ingestion : Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness
Inhalation : No specific data.
Skin contact : Adverse symptoms may include the following:
irritation
redness
Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.
Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.
Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Mixture.Not fully tested.

General : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (dusts and mists)	8.073 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Titanium dioxide			
	Acute LC50 > 1,000,000 µg/l Marine water	Fish - Mummichog	96 h
	Acute LC50 > 1,000 mg/l Fresh water	Fish - Fathead minnow	96 h
	Acute LC50 13 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h
	Acute LC50 6.5 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h
	Acute EC50 19.3 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h
	Acute EC50 27.8 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h
	Acute EC50 35.306 mg/l Fresh water	Aquatic invertebrates. Water flea	48 h

Conclusion/Summary : Not available.

Persistence and degradability

Conclusion/Summary : Not available.

Bioaccumulative potential

Product/ingredient name	LogPow	BCF	Potential
Titanium dioxide		352.00	low

Mobility in soil

Soil/water partition coefficient (KOC)	:	Not available.
Other adverse effects	:	No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Acute hazardous waste "P" List: Not listed

United States - RCRA Toxic hazardous waste "U" List: Not listed

Section 14. Transport information

U.S. DOT Classification	:	Not regulated for transportation.
ICAO/IATA	:	Not classified as dangerous good under transport regulations.
IMO/IMDG (maritime)	:	Not classified as dangerous good under transport regulations.

Section 15. Regulatory information

U.S. Federal regulations : **United States - TSCA 12(b) - Chemical export notification:** None of the components are listed.
United States - TSCA 4(a) - Final Test Rules: Not listed
United States - TSCA 4(a) - ITC Priority list: Not listed
United States - TSCA 4(a) - Proposed test rules: Not listed

United States - TSCA 4(f) - Priority risk review: Not listed
United States - TSCA 5(a)2 - Final significant new use rules: Not listed
United States - TSCA 5(a)2 - Proposed significant new use rules: Not listed
United States - TSCA 5(e) - Substances consent order: Not listed
United States - TSCA 6 - Final risk management: Not listed
United States - TSCA 6 - Proposed risk management: Not listed
United States - TSCA 8(a) - Chemical risk rules: Not listed
United States - TSCA 8(a) - Dioxin/Furane precusor: Not listed
United States - TSCA 8(a) - Chemical Data Reporting (CDR): Not determined
United States - TSCA 8(a) - Preliminary assessment report (PAIR): Not listed
United States - TSCA 8(c) - Significant adverse reaction (SAR): Not listed
United States - TSCA 8(d) - Health and safety studies: Not listed
United States - EPA Clean water act (CWA) section 307 - Priority pollutants: Listed **Chromium (III) oxide**

United States - EPA Clean water act (CWA) section 311 - Hazardous substances: Not listed
United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Flammable substances: Not listed
United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Toxic substances: Not listed
United States - Department of commerce - Precursor chemical: Not listed

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)	:	Not listed
Clean Air Act Section 602 Class I Substances	:	Not listed
Clean Air Act Section 602 Class II Substances	:	Not listed
DEA List I Chemicals (Precursor Chemicals)	:	Not listed
DEA List II Chemicals (Essential Chemicals)	:	Not listed

US. EPA CERCLA Hazardous Substances (40 CFR 302)

not applicable

SARA 311/312

Classification : Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Classification
Miscellaneous Compounds Distillates, petroleum, hydrotreated middle	10 - 30	AH
Titanium dioxide	10 - 30	CH

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Aluminum	7429-90-5	1 - 5
Supplier notification	Aluminum	7429-90-5	1 - 5

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed:
Mica
Titanium dioxide
Aluminum

New York : None of the components are listed.

New Jersey : The following components are listed:
Mica
Titanium dioxide
Aluminum

Pennsylvania : The following components are listed:
Titanium dioxide

Aluminum

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada inventory : All components are listed or exempted.

International regulations

International lists	:	**Australia inventory (AICS):** Not determined. **Taiwan inventory (CSNN):** Not determined. **Malaysia Inventory (EHS Register):** Not determined. **EINECS:** All components are listed or exempted. **Japan inventory:** Not determined. **China inventory (IECSC):** All components are listed or exempted. **Korea inventory:** All components are listed or exempted. **New Zealand Inventory of Chemicals (NZIoC):** Not determined. **Philippines inventory (PICCS):** All components are listed or exempted.
Chemical Weapons Convention List Schedule I Chemicals	:	Not listed
Chemical Weapons Convention List Schedule II Chemicals	:	Not listed
Chemical Weapons Convention List Schedule III Chemicals	:	Not listed

Section 16. Other information

History

Date of printing	:	06/04/2015
Date of issue/Date of revision	:	06/03/2015
Date of previous issue	:	11/20/2014
Version	:	1.1
Key to abbreviations	:	ATE = Acute Toxicity Estimate BCF = Bioconcentration Factor GHS = Globally Harmonized System of Classification and Labelling of Chemicals IATA = International Air Transport Association IBC = Intermediate Bulk Container IMDG = International Maritime Dangerous Goods LogPow = logarithm of the octanol/water partition coefficient MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution) UN = United Nations
References	:	Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution.

Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. Particularly this information may not be valid for such material used in conjunction with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

1. Identification

Product identifier: Trichloroethylene

Other means of identification
Product No.: 9464, 8600, 9458, 9454

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer

Company Name:	Avantor Performance Materials, Inc.
Address:	3477 Corporate Parkway, Suite 200 Center Valley, PA 18034
Telephone:	Customer Service: 855-282-6867
Fax:	
Contact Person:	Environmental Health & Safety
e-mail:	info@avantormaterials.com

Emergency telephone number:
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard Classification

Health Hazards

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2A
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1B
Specific Target Organ Toxicity - Single Exposure	Category 3

Environmental Hazards

Chronic hazards to the aquatic environment	Category 3

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: May cause cancer.
Suspected of causing genetic defects.
Causes serious eye irritation.
Causes skin irritation.
Harmful to aquatic life with long lasting effects.

Precautionary Statement

Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid release to the environment.

Response: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse. Call a POISON CENTER or doctor/physician if you feel unwell. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Storage: Store locked up. Store in a well-ventilated place. Keep container tightly closed.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Substances

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
TRICHLOROETHYLENE		79-01-6	99 - 100%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Rinse mouth. Get medical attention if symptoms occur. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Get medical attention if symptoms persist. If breathing stops, provide artificial respiration.

Skin Contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if irritation persists after washing. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention if irritation persists after washing.

Most important symptoms/effects, acute and delayed

Symptoms: Irritating to eyes, respiratory system and skin.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: In case of fire and/or explosion do not breathe fumes.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical: Contact with metals may evolve flammable hydrogen gas. Fire may produce irritating, corrosive and/or toxic gases.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Keep unauthorized personnel away. Use personal protective equipment. See Section 8 of the MSDS for Personal Protective Equipment. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling: Use personal protective equipment as required. Do not breathe mist or vapor. Do not taste or swallow. Do not eat, drink or smoke when using the product. Use only with adequate ventilation. Wash hands thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment. Avoid contact with eyes. Avoid contact with skin. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Wash contaminated clothing before reuse.

Conditions for safe storage, including any incompatibilities: Store locked up. Keep in a cool, well-ventilated place. Store in a dry place.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source
TRICHLOROETHYLENE	TWA	10 ppm	US. ACGIH Threshold Limit Values (2011)
	STEL	25 ppm	US. ACGIH Threshold Limit Values (2011)
	REL	25 ppm	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	TWA	50 ppm 270 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	STEL	200 ppm 1,080 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	TWA	100 ppm	US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
	Ceiling	200 ppm	US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
	MAX. CONC	300 ppm	US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
	AN ESL	54 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010)

Biological Limit Values

Chemical Identity	Exposure Limit Values	Source
TRICHLOROETHYLENE (Trichloroacetic acid: Sampling time: End of shift at end of work week.)	15 mg/l (Urine)	ACGIH BEL (03 2013)
TRICHLOROETHYLENE (Trichloroethanol, without hydrolysis: Sampling time: End of shift at end of work week.)	0.5 mg/l (Blood)	ACGIH BEL (03 2013)

Appropriate Engineering Controls No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection

Hand Protection: Chemical resistant gloves

Other: Wear suitable protective clothing.

Respiratory Protection: In case of inadequate ventilation use suitable respirator.

Hygiene measures: Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not eat, drink or smoke when using the product. Wash contaminated clothing before reuse.

9. Physical and chemical properties

Appearance

Physical state:	Liquid
Form:	Liquid
Color:	Colorless
Odor:	Ether-like odor
Odor threshold:	No data available.
pH:	No data available.
Melting point/freezing point:	-84.7 °C
Initial boiling point and boiling range:	87.2 °C
Flash Point:	Not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	10.5 %(V) 90 %(V)
Flammability limit - lower (%):	8 %(V) 12.5 %(V)
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	9.2 kPa (25 °C)
Vapor density:	4.53 AIR=1
Relative density:	1.47 (20 °C)
Solubility(ies)	
Solubility in water:	1 g/l (20 °C)
Solubility (other):	acetone: Soluble ethanol: Soluble
Partition coefficient (n-octanol/water):	2.61
Auto-ignition temperature:	420 °C
Decomposition temperature:	No data available.
Viscosity:	No data available.

Other information

Molecular weight:	131.39 g/mol (C_2HCl_3)

10. Stability and reactivity

Reactivity: No dangerous reaction known under conditions of normal use.

Chemical Stability: Material is stable under normal conditions.

Possibility of Hazardous Reactions: Hazardous polymerization does not occur.

Conditions to Avoid: Heat, sparks, flames. Light. Moisture. Contact with incompatible materials.

Incompatible Materials: Strong oxidizing agents. Alkalies. Caustics. Chemically active metals.

Hazardous Decomposition Products: By heating and fire, toxic vapors/gases may be formed. Oxides of Carbon. Phosgene.

11. Toxicological information

Information on likely routes of exposure

Ingestion: May be harmful if swallowed.

Inhalation: May be harmful if inhaled.

Skin Contact: Causes skin irritation.

Eye contact: Causes serious eye irritation.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: LD 50 (Rat): 4,920 mg/kg

Dermal
Product: No data available.

Inhalation
Product: LC 50 (Rat, 4 h): 12000 ppm

Repeated Dose Toxicity
Product: No data available.

Skin Corrosion/Irritation
Product: Causes skin irritation.

Serious Eye Damage/Eye Irritation
Product: Causes serious eye irritation.

Respiratory or Skin Sensitization
Product: Not a skin sensitizer.

Carcinogenicity
Product: May cause cancer.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:

TRICHLOROETHYLENE	Overall evaluation: 1. Carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens:

TRICHLOROETHYLENE	Reasonably Anticipated to be a Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: Suspected of causing genetic defects.

In vivo
Product: Suspected of causing genetic defects.

Reproductive Toxicity
Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure
Product: May cause respiratory irritation. May cause drowsiness or dizziness.

Specific Target Organ Toxicity - Repeated Exposure
Product: No data available.

Aspiration Hazard
Product: Not classified

Other Effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):
TRICHLOROETHYLENE LC 50 (Fathead minnow (Pimephales promelas), 96 h): 31.4 - 71.8 mg/l Mortality
LC 50 (Bluegill (Lepomis macrochirus), 96 h): 39 - 54 mg/l Mortality
EC 50 (Fathead minnow (Pimephales promelas), 96 h): 18.4 - 28.5 mg/l Intoxication

Aquatic Invertebrates
Product: No data available.

Specified substance(s):
TRICHLOROETHYLENE LC 50 (Water flea (Daphnia magna), 48 h): 12 - 26 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: There are no data on the degradability of this product.

BOD/COD Ratio
Product: No data available.

Bioaccumulative Potential
Bioconcentration Factor (BCF)
Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)
Product: Log Kow: 2.61

Mobility in Soil: The product is water soluble and may spread in water systems.

Other Adverse Effects: Harmful to aquatic life with long lasting effects.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN Number:	UN 1710
UN Proper Shipping Name:	Trichloroethylene
Transport Hazard Class(es)	
Class(es):	6.1
Label(s):	6.1
Packing Group:	III
Marine Pollutant:	No

IMDG

UN Number:	UN 1710
UN Proper Shipping Name:	TRICHLOROETHYLENE
Transport Hazard Class(es)	
Class(es):	6.1
Label(s):	6.1
EmS No.:	F-A, S-A
Packing Group:	III
Marine Pollutant:	No

IATA

UN Number:	UN 1710
Proper Shipping Name:	Trichloroethylene
Transport Hazard Class(es):	
Class(es):	6.1
Label(s):	6.1
Marine Pollutant:	No
Packing Group:	III

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):
TRICHLOROETHYLENE Reportable quantity: 100 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

[X] Acute (Immediate) [X] Chronic (Delayed) [ ] Fire [ ] Reactive [ ] Pressure Generating

SARA 302 Extremely Hazardous Substance
None present or none present in regulated quantities.

SARA 304 Emergency Release Notification

Chemical Identity	RQ
TRICHLOROETHYLENE	100 lbs.

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
TRICHLOROETHYLENE	500 lbs

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
TRICHLOROETHYLENE	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)
TRICHLOROETHYLENE Reportable quantity: 100 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):
None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65
TRICHLOROETHYLENE Carcinogenic.
TRICHLOROETHYLENE Male reproductive toxin.
TRICHLOROETHYLENE Developmental toxin.

US. New Jersey Worker and Community Right-to-Know Act
TRICHLOROETHYLENE Listed

US. Massachusetts RTK - Substance List
TRICHLOROETHYLENE Listed

US. Pennsylvania RTK - Hazardous Substances
TRICHLOROETHYLENE Listed

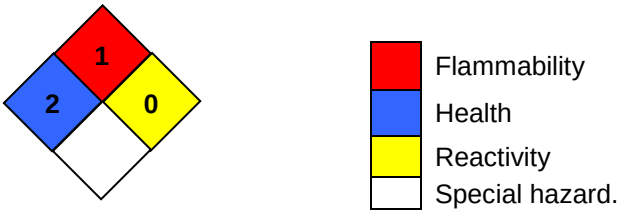
US. Rhode Island RTK
TRICHLOROETHYLENE Listed

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EINECS, ELINCS or NLP:	On or in compliance with the inventory
Japan (ENCS) List:	On or in compliance with the inventory
China Inv. Existing Chemical Substances:	Not in compliance with the inventory.
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Japan ISHL Listing:	On or in compliance with the inventory
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16.Other information, including date of preparation or last revision

NFPA Hazard ID



Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue Date:	01-08-2015
Revision Date:	No data available.
Version #:	1.1
Further Information:	No data available.

Disclaimer:

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SAFETY DATA SHEET

Creation Date 10-Dec-2009 **Revision Date** 06-Nov-2015 **Revision Number** 2

1. Identification

Product Name **Tetrachloroethylene**

Cat No. : **AC167890000; AC167890010; AC167890025; AC167890100; AC167891000; AC167895000**

Synonyms Perchloroethylene

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Skin Sensitization	Category 1
Carcinogenicity	Category 1B
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Tetrachloroethylene	127-18-4	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Obtain medical attention.

Ingestion Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects Breathing difficulties. . May cause allergic skin reaction. Inhalation of high vapor

concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

Hazardous Combustion Products
Chlorine Hydrogen chloride gas Phosgene
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

Environmental Precautions Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Tetrachloroethylene	TWA: 25 ppm STEL: 100 ppm	(Vacated) TWA: 25 ppm (Vacated) TWA: 170 mg/m^3 Ceiling: 200 ppm TWA: 100 ppm	IDLH: 150 ppm

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Tetrachloroethylene	TWA: 25 ppm TWA: 170 mg/m^3 STEL: 100 ppm STEL: 685 mg/m^3	TWA: 100 ppm TWA: 670 mg/m^3 TWA: 200 ppm TWA: 1250 mg/m^3 STEL: 200 ppm STEL: 1340 mg/m^3	TWA: 25 ppm STEL: 100 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic, sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-22 °C / -7.6 °F
Boiling Point/Range	120 - 122 °C / 248 - 251.6 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	6.0 (Ether = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	18 mbar @ 20 °C
Vapor Density	No information available
Specific Gravity	1.625
Solubility	0.15 g/L water (20°C)
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	> 150°C
Viscosity	0.89 mPa s at 20 °C
Molecular Formula	C2 Cl4
Molecular Weight	165.83

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Exposure to moist air or water.

Incompatible Materials Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines

Hazardous Decomposition Products Chlorine, Hydrogen chloride gas, Phosgene

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetrachloroethylene	LD50 = 2629 mg/kg (Rat)	LD50 > 10000 mg/kg (Rat)	LC50 = 27.8 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization May cause sensitization by skin contact

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Tetrachloroethylene	127-18-4	Group 2A	Reasonably Anticipated	A3	X	A3

IARC: (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans
NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)
STOT - repeated exposure Kidney Liver Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest

pain, muscle pain or flushing

Endocrine Disruptor Information

Component	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Tetrachloroethylene	Group II Chemical	Not applicable	Not applicable

Other Adverse Effects Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Tetrachloroethylene	EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata)	LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus) LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas) LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 100 mg/L 24 h EC50 = 112 mg/L 24 h EC50 = 120.0 mg/L 30 min	EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

Component	log Pow
Tetrachloroethylene	2.88

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Tetrachloroethylene - 127-18-4	U210	-

14. Transport information

DOT

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

TDG

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IATA

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IMDG/IMO

UN-No	UN1897
Proper Shipping Name	TETRACHLOROETHYLENE
Hazard Class	6.1
Packing Group	III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Tetrachloroethylene	X	X	-	204-825-9	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Tetrachloroethylene	127-18-4	>95	0.1

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Tetrachloroethylene	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Tetrachloroethylene	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Tetrachloroethylene	100 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Tetrachloroethylene	127-18-4	Carcinogen	14 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Tetrachloroethylene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class D1B Toxic materials
D2A Very toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 10-Dec-2009
Revision Date 06-Nov-2015
Print Date 06-Nov-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

1. Identification

Product identifier: TOLUENE

Other means of identification
Product No.: 9457, 4483, V560, 8604, 9476, 9466, 9460, 9456, 9364, 9351, 9336, 8608

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company Name:	Avantor Performance Materials, Inc.
Address:	3477 Corporate Parkway, Suite 200 Center Valley, PA 18034
Telephone:	Customer Service: 855-282-6867
Fax:	
Contact Person:	Environmental Health & Safety
e-mail:	info@avantormaterials.com

Emergency telephone number:
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard classification

Physical hazards

Flammable liquids	Category 2

Health hazards

Acute toxicity (Oral)	Category 4
Acute toxicity (Inhalation - vapor)	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Toxic to reproduction	Category 2
Specific target organ toxicity - single exposure	Category 3
Specific target organ toxicity - repeated exposure	Category 2
Aspiration hazard	Category 1

Environmental hazards

Acute hazards to the aquatic environment	Category 2

Label elements

Hazard symbol:

Signal word: Danger

Hazard statement:
Highly flammable liquid and vapor.
Harmful if swallowed or if inhaled.
Causes skin irritation.
Causes serious eye irritation.
Suspected of damaging fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
May cause damage to organs through prolonged or repeated exposure.
Toxic to aquatic life.

Precautionary statement

Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment.

Response: In case of fire: Use water spray, foam, dry powder or carbon dioxide for extinction. IF exposed or concerned: Get medical advice/attention. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting.

Storage: Store locked up. Store in a well-ventilated place. Keep cool. Keep container tightly closed.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor. May cause flash fire or explosion.

3. Composition/information on ingredients

Substances

Chemical identity	Common name and synonyms	CAS number	Content in percent (%)*
TOLUENE		108-88-3	99 - 100%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Get medical attention immediately.

Skin contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

Most important symptoms/effects, acute and delayed

Symptoms: Harmful if swallowed. May be fatal if swallowed. Harmful if inhaled. Irritating to eyes, respiratory system and skin.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General fire hazards: In case of fire and/or explosion do not breathe fumes.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Water spray, foam, dry powder or carbon dioxide.

Unsuitable extinguishing media: Avoid water in straight hose stream; will scatter and spread fire.

Specific hazards arising from the chemical: Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Prevent buildup of vapors or gases to explosive concentrations.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out. Water may be ineffective in fighting the fire. Fight fire from a protected location. Move containers from fire area if you can do so without risk.

Special protective equipment for fire-fighters:	Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Keep upwind. Use personal protective equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. See Section 8 of the MSDS for Personal Protective Equipment.
Methods and material for containment and cleaning up:	Eliminate all ignition sources if safe to do so. Take precautionary measures against static discharges. Stop leak if possible without any risk. Use only non-sparking tools. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.
Notification Procedures:	Prevent entry into waterways, sewer, basements or confined areas. Inform authorities if large amounts are involved.
Environmental precautions:	Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling:	DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Wear protective gloves/protective clothing/eye protection/face protection. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Wash hands thoroughly after handling.
Conditions for safe storage, including any incompatibilities:	Keep away from food, drink and animal feeding stuffs. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids.

8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Chemical identity	Type	Exposure Limit values		Source
TOLUENE	TWA	20 ppm		US. ACGIH Threshold Limit Values (2011)
	STEL	150 ppm	560 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	REL	100 ppm	375 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	TWA	100 ppm	375 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	STEL	150 ppm	560 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	TWA	200 ppm		US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
	Ceiling	300 ppm		US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
	MAX. CONC	500 ppm		US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)

Biological limit values

Chemical identity	Exposure Limit values	Source
TOLUENE (o-Cresol, with hydrolysis: Sampling time: End of shift.)	0.3 mg/g (Creatinine in urine)	ACGIH BEL (2011)
TOLUENE (toluene: Sampling time: Prior to last shift of work week.)	0.02 mg/l (Blood)	ACGIH BEL (2011)
TOLUENE (toluene: Sampling time: End of shift.)	0.03 mg/l (Urine)	ACGIH BEL (2011)

Appropriate engineering controls No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area. Use explosion-proof ventilation equipment.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin protection

Hand protection: Chemical resistant gloves

Other: Wear suitable protective clothing.

Respiratory protection: In case of inadequate ventilation use suitable respirator.

Hygiene measures: Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

9. Physical and chemical properties

Appearance

Physical state:	Liquid
Form:	Liquid
Color:	Colorless
Odor:	Sweet aromatic odor
Odor threshold:	No data available.
pH:	No data available.
Melting point/freezing point:	-94.9 °C
Initial boiling point and boiling range:	110 °C
Flash Point:	4 °C (Closed Cup)
Evaporation rate:	2.24 (butyl acetate=1)
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	7.1 %(V)
Flammability limit - lower (%):	1.1 %(V)
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	3.8 kPa (25 °C)
Vapor density:	3.1 AIR=1
Relative density:	0.86 (20 °C)
Solubility(ies)	
Solubility in water:	0.7 g/l (23.3 °C)
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	2.73
Auto-ignition temperature:	480 °C
Decomposition temperature:	No data available.
Viscosity:	No data available.

Other information

Molecular weight:	92.14 g/mol (C_7H_8)

10. Stability and reactivity

Reactivity:	No dangerous reaction known under conditions of normal use.
Chemical stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur.
Conditions to avoid:	Heat, sparks, flames.
Incompatible materials:	Strong oxidizing agents. Chlorine.
Hazardous decomposition products:	Thermal decomposition may release oxides of carbon.

11. Toxicological information

Information on likely routes of exposure

Ingestion:	Harmful if swallowed.
Inhalation:	Harmful if inhaled. May cause irritation to the mucous membranes and upper respiratory tract.

Skin contact: Causes skin irritation.

Eye contact: Causes serious eye irritation.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: LD 50 (Rat): 636 mg/kg

Dermal
Product: LD 50 (Rabbit): 12,124 mg/kg

Inhalation
Product: LC 50 (Mouse, 24 h): 400 mg/l
LC 50 (Rat, 4 h): 8,000 mg/l

Repeated dose toxicity
Product: No data available.

Skin corrosion/irritation
Product: Causes skin irritation.

Serious eye damage/eye irritation
Product: Causes serious eye irritation.

Respiratory or skin sensitization
Product: Not a skin sensitizer.

Carcinogenicity
Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ cell mutagenicity

In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive toxicity
Product: May damage fertility or the unborn child.

Specific target organ toxicity - single exposure
Product: Narcotic effect. Respiratory tract irritation.

Specific target organ toxicity - repeated exposure
Product: Peripheral nervous system Central nervous system. Kidneys. auditory organs

Aspiration hazard
Product: May be fatal if swallowed and enters airways.

Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product: No data available.

Specified substance(s):

TOLUENE — LC 50 (Fathead minnow (Pimephales promelas), 96 h): 12.6 mg/l Mortality
LC 50 (Coho salmon,silver salmon (Oncorhynchus kisutch), 96 h): 5.5 mg/l Mortality

Aquatic invertebrates

Product: No data available.

Specified substance(s):

TOLUENE — EC 50 (Brine shrimp (Artemia sp.), 24 h): 22.1 - 54.1 mg/l Intoxication
EC 50 (Water flea (Daphnia magna), 48 h): 5.46 - 9.83 mg/l Intoxication

Chronic hazards to the aquatic environment:

Fish

Product: No data available.

Aquatic invertebrates

Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and degradability

Biodegradation

Product: Expected to be readily biodegradable.

BOD/COD ratio

Product: No data available.

Bioaccumulative potential

Bioconcentration factor (BCF)

Product: Bioaccumulation is unlikely to be significant because of the low water solubility of this product.

Partition coefficient n-octanol / water (log Kow)

Product: Log Kow: 2.73

Mobility in soil: The product is insoluble in water and will spread on the water surface.

Other adverse effects: Toxic to aquatic organisms.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws. Residual vapors may explode on ignition; do not cut, drill, grind, or weld on or near this container.

Contaminated packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number:	UN 1294
UN proper shipping name:	Toluene
Transport hazard class(es)	
Class(es):	3
Label(s):	3
Packing group:	II
Marine Pollutant:	No

IMDG

UN number:	UN 1294
UN proper shipping name:	TOLUENE
Transport hazard class(es)	
Class(es):	3
Label(s):	3
EmS No.:	F-E, S-D
Packing group:	II
Marine Pollutant:	No

IATA

UN number:	UN 1294
Proper Shipping Name:	Toluene
Transport hazard class(es):	
Class(es):	3
Label(s):	3
Marine Pollutant:	No
Packing group:	II

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

TOLUENE Reportable quantity: 1000 lbs.

Superfund amendments and reauthorization act of 1986 (SARA)

Hazard categories

[X] Acute (Immediate) [X] Chronic (Delayed) [X] Fire [ ] Reactive [ ] Pressure Generating

SARA 302 Extremely hazardous substance

None present or none present in regulated quantities.

SARA 304 Emergency release notification

Chemical identity	RQ
TOLUENE	1000 lbs.

SARA 311/312 Hazardous chemical

Chemical identity	Threshold Planning Quantity
TOLUENE	500 lbs

SARA 313 (TRI reporting)

Chemical identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
TOLUENE	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

TOLUENE Reportable quantity: 1000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

None present or none present in regulated quantities.

US state regulations

US. California Proposition 65

TOLUENE Developmental toxin.
TOLUENE Female reproductive toxin.

US. New Jersey Worker and Community Right-to-Know Act

TOLUENE Listed

US. Massachusetts RTK - Substance List

TOLUENE Listed

US. Pennsylvania RTK - Hazardous Substances

TOLUENE Listed

US. Rhode Island RTK

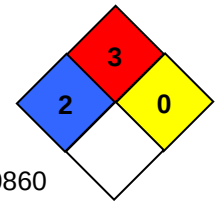
TOLUENE Listed

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EU EINECS List:	On or in compliance with the inventory
EU ELINCS List:	Not in compliance with the inventory.
Japan (ENCS) List:	On or in compliance with the inventory
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	On or in compliance with the inventory
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Switzerland Consolidated Inventory:	Not in compliance with the inventory.
Japan ISHL Listing:	On or in compliance with the inventory
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16.Other information, including date of preparation or last revision

NFPA Hazard ID



Flammability
Health

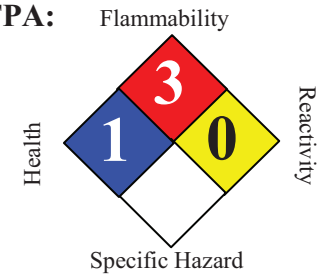
Reactivity
Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue date:	06-12-2014
Revision date:	No data available.
Version #:	1.0
Further information:	No data available.
Disclaimer:	THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED “AS IS,” AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION<(>,<)> WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.

Safety Data Sheet
Gasoline, Unleaded

NFPA:



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Gasoline, Unleaded			
Synonyms	:	Blend of Highly Flammable Petroleum Distillates, Regular, Mid-Grade, Premium, 888100008809			
SDS Number	:	888100008809	**Version**	:	1.1
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications :
Flammable Liquid – Category 1 or 2 depending on formulation.
Aspiration Hazard – Category 1
Carcinogenicity – Category 2
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Skin Irritation – Category 2
Eye Irritation – Category 2B
Chronic Aquatic Toxicity – Category 2

Pictograms :

Signal Word : **Danger**

Hazard Statements

Extremely flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
Suspected of causing blood cancer if repeated over-exposure by inhalation and/or skin contact occurs.
May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation or skin contact. Causes eye irritation. Can be absorbed through skin.
May cause drowsiness or dizziness. Extreme exposure such as intentional inhalation may cause unconsciousness, asphyxiation and death.
Repeated or prolonged skin contact can cause irritation and dermatitis.

Harmful to aquatic life.

Precautionary statements

Prevention : Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, welding and hot surfaces.
No smoking.
Keep container tightly closed.
Ground and/or bond container and receiving equipment.
Use explosion-proof electrical equipment.
Use only non-sparking tools (if tools are used in flammable atmosphere).
Take precautionary measures against static discharge.
Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
Wash hands or liquid-contacted skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Do not breathe vapors.
Use only outdoors or in a well-ventilated area.

Response : In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish.
If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If skin or eye irritation persists, get medical attention.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Get medical attention if you feel unwell.

Storage : Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers. Some containers not approved for gasoline may dissolve and release flammable gasoline liquid and vapors.

Disposal : Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Gasoline, natural; Low boiling point naphtha	8006-61-9	10 - 30%
Toluene	108-88-3	10 - 30%
Xylene	1330-20-7	10 - 30%
Ethanol; ethyl alcohol	64-17-5	0-8.2%
Trimethylbenzene	25551-13-7	1 - 5%
Isopentane; 2-methylbutane	78-78-4	1 - 5%

Naphthalene	91-20-3	1 - 5%
Benzene	71-43-2	Less than 1.3%
Pentane	109-66-0	1 - 5%
Cyclohexane	110-82-7	1 - 5%
Ethylbenzene	100-41-4	1 - 5%
Butane	106-97-8	1 - 20%
Heptane [and isomers]	142-82-5	0.5 - 0.75%
N-hexane	110-54-3	0.5 - 0.75%

SECTION 4. FIRST AID MEASURES

Inhalation : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Contaminated leather, particularly footwear, must be discarded. Note that contaminated clothing may be a fire hazard. Seek medical advice if symptoms persist or develop.

Eye contact : Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice if symptoms persist or develop.

Ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Obtain medical attention.

Notes to physician : Symptoms: Dizziness, Discomfort, Headache, Nausea, Kidney disorders, Liver disorders. Aspiration may cause pulmonary edema and pneumonitis. Swallowing gasoline is more likely to be fatal for small children than adults, even if aspiration does not occur.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.

Specific hazards during fire fighting : Extremely flammable liquid and vapor. This material is combustible/flammable and is sensitive to fire, heat, and static discharge.

Special protective equipment for fire-fighters : Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Further information : Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam. Exposure to decomposition products may be a hazard to health. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Evacuate personnel to safe areas. Ventilate the area. Remove all sources of ignition. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental precautions : Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.

Methods for cleaning up : Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling : Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).
(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Reports suggest that government-mandated ethanol, if present, may not be compatible with fiberglass gasoline tanks. Ethanol may dissolve fiberglass resin, causing engine damage and possibly allow leakage of explosive gasoline.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Store only in containers approved and labeled for gasoline.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_ACT	0.5 ppm
OSHA Z1	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Ethanol; Ethyl alcohol	64-17-5	PEL	1,000 ppm 1,900 mg/m3
	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Cyclohexane	110-82-7	PEL	300 ppm 1,050 mg/m3
	Ethylbenzene	100-41-4	PEL	100 ppm 435 mg/m3
	Heptane [and isomers]	142-82-5	PEL	500 ppm 2,000 mg/m3
	N-hexane	110-54-3	PEL	500 ppm 1,800 mg/m3
ACGIH	Toluene	108-88-3	TWA	50 ppm
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Ethanol; Ethyl alcohol	64-17-5	TWA	1,000 ppm
	Trimethylbenzene	25551-13-7	TWA	25 ppm
	Isopentane; 2-Methylbutane	78-78-4	TWA	600 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Pentane	109-66-0	TWA	600 ppm
	Cyclohexane	110-82-7	TWA	100 ppm
	Ethylbenzene	100-41-4	TWA	100 ppm
		100-41-4	STEL	125 ppm
	Heptane [and isomers]	142-82-5	TWA	400 ppm
		142-82-5	STEL	500 ppm

	N-hexane	110-54-3	TWA	50 ppm

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Ensure that eyewash stations and safety showers are close to the workstation location.

Hand protection : Gloves constructed of nitrile or neoprene are recommended. Consult manufacturer specifications for further information.

Skin and body protection : If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.

Respiratory protection : A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Work / Hygiene practices : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Clear to straw colored liquid

Odor : Characteristic hydrocarbon-like

Odor threshold 0.5 - 1.1 ppm

pH : Not applicable

Melting point/freezing point About -101°C (-150°F)

Initial boiling point & range Boiling point varies: 30 – 200°C (85 – 392°F)

Flash point < -21°C (-5.8°F)

Evaporation rate : Higher initially and declining as lighter components evaporate

Flammability (solid, gas) : Flammable vapor released by liquid

Upper explosive limit	7.6 %(V)
Lower explosive limit	1.3 %(V)
Vapor pressure	345 - 1,034 hPa at 37.8 °C (100.0 °F)
Vapor density (air = 1)	Approximately 3 to 4
Relative density (water = 1)	0.8 g/mL
Solubility (in water)	Negligible
Partition coefficient (n-octanol/water)	2 – 7 as log Pow
Auto-ignition temperature	Approximately 250°C (480°F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	0.64 to 0.88 mm²/s range reported for gasoline
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature)	: Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with ”ultra-low conductivities” below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	: Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, alkaline products and strong acids. Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.
Conditions to avoid	: Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	: Ignition and burning can release carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

SECTION 11. TOXICOLOGICAL INFORMATION

Skin contact	: Irritating to skin. Can be partially absorbed through skin.
Eye contact	: Irritating to eyes.
Ingestion	: Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.

Inhalation and further information

Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, over excitation. Exposure to very high levels can result in unconsciousness and death.

Repeated over-exposure may cause liver and kidney injuries.
Components of the product may affect the nervous system.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.
This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

Component:

Gasoline, natural; Low boiling point naphtha	8006-61-9	Acute oral toxicity: LD50 rat Dose: 18.8 mg/kg Acute inhalation toxicity: LC50 rat Dose: 20.7 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Moderate eye irritation
Toluene	108-88-3	Acute oral toxicity: LD50 rat Dose: 636 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 12,124 mg/kg Acute inhalation toxicity: LC50 rat Dose: 49 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may defat the skin and produce dermatitis. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Xylene	1330-20-7	Acute oral toxicity: LD50 rat Dose: 2,840 mg/kg Acute dermal toxicity: LD50 rabbit Dose: ca. 4,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 6,350 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation

		Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Ethanol; Ethyl alcohol	64-17-5	Acute oral toxicity: LD50 rat Dose: 6,200 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 19,999 mg/kg Acute inhalation toxicity: LC50 rat Dose: 8,001 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may cause skin irritation and/or dermatitis. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Mild eye irritation
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130
Benzene	71-43-2	Acute oral toxicity: LD50 rat Dose: 930 mg/kg Acute inhalation toxicity: LC50 rat Dose: 44 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Risk of serious damage to eyes.
Pentane	109-66-0	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 364 mg/l Exposure time: 4 h Skin irritation: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Cyclohexane	110-82-7	Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 14 mg/l Exposure time: 4 h

		Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Ethylbenzene	100-41-4	Acute oral toxicity: LD50 rat Dose: 3,500 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 15,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 18 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Risk of serious damage to eyes.
Heptane [and isomers]	142-82-5	Acute oral toxicity: LD50 rat Dose: 15,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 103 g/m3 Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
N-hexane	110-54-3	Acute oral toxicity: LD50 rat Dose: 25,000 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 171.6 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Teratogenicity: N11.00418960

Carcinogenicity

NTP	:	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	:	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	:	Benzene (CAS-No.: 71-43-2)
CA Prop 65	:	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3)

Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Toluene	108-88-3	Toxicity to fish: LC50 Species: Carassius auratus (goldfish) Dose: 13 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 11.5 mg/l Exposure time: 48 h Toxicity to algae: IC50 Species: Selenastrum capricornutum (green algae) Dose: 12 mg/l Exposure time: 72 h
Ethanol; Ethyl alcohol	64-17-5	Toxicity to fish: LC50 Species: Leuciscus idus (Golden orfe) Dose: 8,140 mg/l Exposure time: 48 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 9,268 - 14,221 mg/l Exposure time: 48 h
Isopentane; 2-Methylbutane	78-78-4	Toxicity to fish: LC50 Species: Oncorhynchus mykiss (rainbow trout) Dose: 3.1 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 2.3 mg/l Exposure time: 96 h
Naphthalene	91-20-3	Toxicity to algae: EC50 Species: Dose: 33 mg/l Exposure time: 24 h
Pentane	109-66-0	Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 9.74 mg/l Exposure time: 48 h
Cyclohexane	110-82-7	Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 3.78 mg/l Exposure time: 48 h

Heptane [and isomers]	142-82-5	Toxicity to fish: LC50 Species: Carassius auratus (goldfish) Dose: 4 mg/l Exposure time: 24 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 1.5 mg/l Exposure time: 48 h
N-hexane	110-54-3	Toxicity to fish: LC50 Species: Pimephales promelas (fathead minnow) Dose: 2.5 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 2.1 mg/l Exposure time: 48 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	: Petrol
UN-No.	: 1203
Class	: 3
Packing group	: II

TDG

Proper shipping name	: Gasoline
UN-No.	: UN1203
Class	: 3
Packing group	: II

IATA Cargo Transport

UN UN-No.	: UN1203
Description of the goods	: Gasoline
Class	: 3
Packaging group	: II
ICAO-Labels	: 3
Packing instruction (cargo aircraft)	: 364
Packing instruction (cargo aircraft)	: Y341

IATA Passenger Transport

UN UN-No.	: UN1203
Description of the goods	: Gasoline
Class	: 3

Packaging group	:	II
ICAO-Labels	:	3
Packing instruction (passenger aircraft)	:	353
Packing instruction (passenger aircraft)	:	Y341

IMDG-Code

UN-No.	:	UN 1203
Description of the goods	:	Gasoline
Class	:	3
Packaging group	:	II
IMDG-Labels	:	3
EmS Number	:	F-E S-E
Marine pollutant	:	No

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable liquid
Highly toxic by ingestion
Moderate skin irritant
Severe eye irritant
Carcinogen

TSCA Status : On TSCA Inventory

DSL Status : . All components are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene	108-88-3
Benzene	71-43-2

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 08/09/2012

6, 8, 10, 12, 14, 16, 64, 68, 91, 112, 306, 1092, 1106, 1500, 1570, 1571, 1651, 1652, 1654, 1700, 1701, 1702, 1710, 1711, 1714, 1726, 1729, 1730, 1732, 1733, 1826, 1848, 1880, 1950

SAFETY DATA SHEET

Creation Date 13-Feb-2015 **Revision Date** 21-Feb-2014 **Revision Number** 3

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identification

Product Description:	**Xylene**
Cat No. :	**6601, 6615, 6655, 9900-5, 9900-55, 6601E**
Synonyms	Dimethylbenzene; Methyltoluene
Molecular Formula	C8H10

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Laboratory chemicals.
Uses advised against	No Information available

1.3. Details of the supplier of the safety data sheet

Company	Richard Allan Scientific A Subsidiary of Thermo Fisher Scientific 4481 Campus Drive Kalamazoo, MI 49008 Tel: (800) 522-7270
E-mail address	begel.sdsdesk@thermofisher.com

1.4. Emergency telephone number

Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

CLP Classification - Regulation (EC) No 1272/2008

Physical hazards

Flammable liquids	Category 3

Health hazards

Aspiration Toxicity	Category 1
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/irritation	Category 2
Specific target organ toxicity - (repeated exposure)	Category 2

Environmental hazards

Based on available data, the classification criteria are not met

Classification according to EU Directives 67/548/EEC or 1999/45/EC

Symbol(s)	Xn - Harmful
R-phrase(s)	R10 - Flammable R38 - Irritating to skin R20/21 - Harmful by inhalation and in contact with skin

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

2.2. Label elements

Signal Word **Danger**

Hazard Statements

H226 - Flammable liquid and vapor
H312 - Harmful in contact with skin
H332 - Harmful if inhaled
H315 - Causes skin irritation
H304 - May be fatal if swallowed and enters airways
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P280 - Wear protective gloves/ protective clothing
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P312 - Call a POISON CENTER or doctor/ physician if you feel unwell
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician
P331 - Do NOT induce vomiting
P362 - Take off contaminated clothing and wash before reuse
P260 - Do not breathe dust/fume/gas/mist/vapors/spray

2.3. Other hazards

No information available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No	EC-No.	Weight %	CLP Classification - Regulation (EC) No 1272/2008	DSD Classification - 67/548/EEC
Ethylbenzene	100-41-4	EEC No. 202-849-4	10 - 15	Flam. Liq. 2 (H225) Acute Tox. 4 (H332) Asp. Tox. 1 (H304) STOT RE 2 (H373) Aquatic Chronic 3 (H412)	F; R11 Xn; R20-48/20 R65
Xylenes (o-, m-, p- isomers)	1330-20-7	EEC No. 215-535-7	85	Acute Tox. 4 (H312) Acute Tox. 4 (H332) Skin Irrit. 2 (H315) Flam. Liq. 3 (H226)	R10 Xn; R20/21 Xi; R38
Toluene	108-88-3	EEC No. 203-625-9	0 - 0.5	Skin Irrit. 2 (H315) Repr. 2 (H361d) STOT SE 3 (H336) STOT RE 2 (H373) Asp. Tox. 1 (H304) Flam. Liq. 2 (H225)	F; R11 Xi; R38 Xn; R48/20-65 Repr.Cat.3; R63 R67
Benzene	71-43-2	EEC No. 200-753-7	0 - 0.01	Skin Irrit. 2 (H315) Eye Irrit. 2 (H319) Muta. 1B (H340) Carc. 1A (H350) STOT RE 1 (H372)	F; R11 Xi; R36/38 Carc.Cat.1; R45 Muta.Cat.2; R46 T; R48/23/24/25

				Asp. Tox. 1 (H304) Flam. Liq. 2 (H225)	Xn; R65

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General Advice If symptoms persist, call a physician. Show this safety data sheet to the doctor in attendance.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required. Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. If symptoms persist, call a physician.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required. Call a physician immediately. SPEEDY ACTION IS CRITICAL, GET MEDICAL AID IMMEDIATELY. If symptoms persist, call a physician. If skin irritation persists, call a physician. Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately. Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Consult a physician.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required. Immediate medical attention is not required. Move to fresh air in case of accidental inhalation of vapors. If symptoms persist, call a physician.

Protection of First-aiders Use personal protective equipment.

4.2. Most important symptoms and effects, both acute and delayed

Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
CO_2, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.

Extinguishing media which must not be used for safety reasons
No information available.

5.2. Special hazards arising from the substance or mixture

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO), Carbon dioxide (CO_2), Hydrocarbons, Aldehydes.

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Do not get in eyes, on skin, or on clothing. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

6.2. Environmental precautions

Should not be released into the environment. See Section 12 for additional ecological information. Do not flush into surface water or sanitary sewer system. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains.

6.3. Methods and material for containment and cleaning up

Remove all sources of ignition. Soak up with inert absorbent material. Take precautionary measures against static discharges. Keep in suitable, closed containers for disposal.

6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Use only under a chemical fume hood. Wear personal protective equipment. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Do not ingest. Pay attention to flashback. No information available. Do not take internally.

7.2. Conditions for safe storage, including any incompatibilities

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area. Keep containers tightly closed in a cool, well-ventilated place. Keep in properly labeled containers.

7.3. Specific end use(s)

Use in laboratories

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits

Component	European Union	The United Kingdom	France	Belgium	Spain
Ethylbenzene	TWA: 100 ppm 8 hr TWA: 442 mg/m³ 8 hr STEL: 200 ppm 15 min STEL: 884 mg/m³ 15 min Possibility of significant uptake through the skin	STEL: 125 ppm 15 min STEL: 552 mg/m³ 15 min TWA: 100 ppm 8 hr TWA: 441 mg/m³ 8 hr Skin	TWA / VME: 20 ppm (8 heures). restrictive limit TWA / VME: 88.4 mg/m³ (8 heures). restrictive limit TWA / VME: 1000 mg/m³ (8 heures). STEL / VLCT: 100 ppm. restrictive limit STEL / VLCT: 442	TWA: 100 ppm 8 uren TWA: 442 mg/m³ 8 uren STEL: 125 ppm 15 minuten STEL: 551 mg/m³ 15 minuten Huid	STEL / VLA-EC: 200 ppm (15 minutos). STEL / VLA-EC: 884 mg/m³ (15 minutos). TWA / VLA-ED: 100 ppm (8 horas) TWA / VLA-ED: 441 mg/m³ (8 horas) Piel

			mg/m³. restrictive limit STEL / VLCT: 1500 mg/m³. Peau		
Xylenes (o-, m-, p-isomers)	TWA: 50 ppm 8 hr TWA: 221 mg/m³ 8 hr STEL: 100 ppm 15 min STEL: 442 mg/m³ 15 min Possibility of significant uptake through the skin	STEL: 100 ppm 15 min STEL: 441 mg/m³ 15 min TWA: 50 ppm 8 hr TWA: 220 mg/m³ 8 hr Skin	TWA / VME: 50 ppm (8 heures). restrictive limit TWA / VME: 221 mg/m³ (8 heures). restrictive limit TWA / VME: 1000 mg/m³ (8 heures). STEL / VLCT: 100 ppm. restrictive limit STEL / VLCT: 442 mg/m³. restrictive limit STEL / VLCT: 1500 mg/m³. Peau	TWA: 50 ppm 8 uren TWA: 221 mg/m³ 8 uren STEL: 100 ppm 15 minuten STEL: 442 mg/m³ 15 minuten Huid	STEL / VLA-EC: 100 ppm (15 minutos). STEL / VLA-EC: 442 mg/m³ (15 minutos). TWA / VLA-ED: 50 ppm (8 horas) TWA / VLA-ED: 221 mg/m³ (8 horas) Piel
Toluene	TWA: 50 ppm 8 hr TWA: 192 mg/m³ 8 hr STEL: 100 ppm 15 min STEL: 384 mg/m³ 15 min Skin	STEL: 100 ppm 15 min STEL: 384 mg/m³ 15 min TWA: 50 ppm 8 hr TWA: 191 mg/m³ 8 hr Skin	TWA / VME: 20 ppm (8 heures). restrictive limit TWA / VME: 76.8 mg/m³ (8 heures). restrictive limit TWA / VME: 1000 mg/m³ (8 heures). STEL / VLCT: 100 ppm. restrictive limit STEL / VLCT: 384 mg/m³. restrictive limit STEL / VLCT: 1500 mg/m³. Peau	TWA: 20 ppm 8 uren TWA: 77 mg/m³ 8 uren STEL: 100 ppm 15 minuten STEL: 384 mg/m³ 15 minuten Huid	STEL / VLA-EC: 100 ppm (15 minutos). STEL / VLA-EC: 384 mg/m³ (15 minutos). TWA / VLA-ED: 50 ppm (8 horas) TWA / VLA-ED: 192 mg/m³ (8 horas) Piel
Benzene	TWA: 1 ppm 8 hr measured or calculated in relation to a reference period of eight hours TWA: 3.25 mg/m³ 8 hr measured or calculated in relation to a reference period of eight hours Substantial contribution to the total body burden via dermal exposure possible	STEL: 3 ppm 15 min STEL: 9.75 mg/m³ 15 min TWA: 1 ppm 8 hr TWA: 3.25 mg/m³ 8 hr Carc. Skin	TWA / VME: 1 ppm (8 heures). restrictive limit TWA / VME: 3.25 mg/m³ (8 heures). restrictive limit TWA / VME: 1000 mg/m³ (8 heures). STEL / VLCT: 1500 mg/m³. Peau	TWA: 1 ppm 8 uren TWA: 3.25 mg/m³ 8 uren Huid	TWA / VLA-ED: 1 ppm (8 horas) TWA / VLA-ED: 3.25 mg/m³ (8 horas) Piel

Component	Italy	Germany	Portugal	The Netherlands	Finland
Ethylbenzene	TWA: 100 ppm 8 ore. TWA: 442 mg/m³ 8 ore. STEL: 200 ppm 15 minuti. Breve termine STEL: 884 mg/m³ 15 minuti. Breve termine Pelle	TWA: 20 ppm (8 Stunden). AGW - exposure factor 2 TWA: 88 mg/m³ (8 Stunden). AGW - exposure factor 2 TWA: 20 ppm (8 Stunden). MAK TWA: 88 mg/m³ (8 Stunden). MAK Höhepunkt: 40 ppm Höhepunkt: 176 mg/m³ Haut	STEL: 200 ppm 15 minutos STEL: 884 mg/m³ 15 minutos TWA: 100 ppm 8 horas TWA: 442 mg/m³ 8 horas Pele	huid STEL: 430 mg/m³ 15 minuten TWA: 215 mg/m³ 8 uren	TWA: 50 ppm 8 tunteina TWA: 220 mg/m³ 8 tunteina STEL: 200 ppm 15 minuutteina STEL: 880 mg/m³ 15 minuutteina Iho
Xylenes (o-, m-, p-isomers)	TWA: 50 ppm 8 ore. pure TWA: 221 mg/m³ 8 ore. pure STEL: 100 ppm 15 minuti. Breve termine pure STEL: 442 mg/m³ 15 minuti. Breve termine pure Pelle	TWA: 100 ppm (8 Stunden). AGW - exposure factor 2 TWA: 440 mg/m³ (8 Stunden). AGW - exposure factor 2 TWA: 100 ppm (8 Stunden). MAK all isomers TWA: 440 mg/m³ (8 Stunden). MAK all isomers	STEL: 100 ppm 15 minutos STEL: 442 mg/m³ 15 minutos TWA: 50 ppm 8 horas TWA: 221 mg/m³ 8 horas Pele	huid STEL: 442 mg/m³ 15 minuten TWA: 210 mg/m³ 8 uren	TWA: 50 ppm 8 tunteina TWA: 220 mg/m³ 8 tunteina STEL: 100 ppm 15 minuutteina STEL: 440 mg/m³ 15 minuutteina Iho

		Höhepunkt: 200 ppm Höhepunkt: 880 mg/m³ Haut Haut all isomers			
Toluene	TWA: 50 ppm 8 ore. TWA: 192 mg/m³ 8 ore. Pelle	TWA: 50 ppm (8 Stunden). AGW - exposure factor 4 TWA: 190 mg/m³ (8 Stunden). AGW - exposure factor 4 TWA: 50 ppm (8 Stunden). MAK TWA: 190 mg/m³ (8 Stunden). MAK Höhepunkt: 200 ppm Höhepunkt: 760 mg/m³ Haut	STEL: 100 ppm 15 minutos STEL: 384 mg/m³ 15 minutos TWA: 50 ppm 8 horas TWA: 192 mg/m³ 8 horas Pele	STEL: 384 mg/m³ 15 minuten TWA: 150 mg/m³ 8 uren	TWA: 25 ppm 8 tunteina TWA: 81 mg/m³ 8 tunteina STEL: 100 ppm 15 minuutteina STEL: 380 mg/m³ 15 minuutteina Iho
Benzene	TWA: 1 ppm 8 ore. TWA: 3.25 mg/m³ 8 ore. Pelle	Haut	STEL: 2.5 ppm 15 minutos TWA: 0.5 ppm 8 horas Pele	huid TWA: 3.25 mg/m³ 8 uren	TWA: 1 ppm 8 tunteina TWA: 3.25 mg/m³ 8 tunteina Iho

Component	Austria	Denmark	Switzerland	Poland	Norway
Ethylbenzene	Haut MAK-KZW: 200 ppm 15 Minuten MAK-KZW: 880 mg/m³ 15 Minuten MAK-TMW: 100 ppm 8 Stunden MAK-TMW: 440 mg/m³ 8 Stunden	TWA: 50 ppm 8 timer TWA: 217 mg/m³ 8 timer Hud	Haut/Peau STEL: 50 ppm 15 Minuten STEL: 220 mg/m³ 15 Minuten TWA: 50 ppm 8 Stunden TWA: 220 mg/m³ 8 Stunden	STEL: 400 mg/m³ 15 minutach TWA: 200 mg/m³ 8 godzinach	TWA: 5 ppm 8 timer TWA: 20 mg/m³ 8 timer STEL: 10 ppm 15 minutter. STEL: 30 mg/m³ 15 minutter. Hud
Xylenes (o-, m-, p-isomers)	Haut MAK-KZW: 100 ppm 15 Minuten MAK-KZW: 442 mg/m³ 15 Minuten MAK-TMW: 50 ppm 8 Stunden MAK-TMW: 221 mg/m³ 8 Stunden	TWA: 25 ppm 8 timer TWA: 109 mg/m³ 8 timer Hud	Haut/Peau STEL: 200 ppm 15 Minuten STEL: 870 mg/m³ 15 Minuten TWA: 100 ppm 8 Stunden TWA: 435 mg/m³ 8 Stunden	TWA: 100 mg/m³ 8 godzinach	TWA: 25 ppm 8 timer TWA: 108 mg/m³ 8 timer STEL: 37.5 ppm 15 minutter. STEL: 135 mg/m³ 15 minutter. Hud
Toluene	Haut MAK-KZW: 100 ppm 15 Minuten MAK-KZW: 380 mg/m³ 15 Minuten MAK-TMW: 50 ppm 8 Stunden MAK-TMW: 190 mg/m³ 8 Stunden	TWA: 25 ppm 8 timer TWA: 94 mg/m³ 8 timer Hud	Haut/Peau STEL: 200 ppm 15 Minuten STEL: 760 mg/m³ 15 Minuten TWA: 50 ppm 8 Stunden TWA: 190 mg/m³ 8 Stunden	STEL: 200 mg/m³ 15 minutach TWA: 100 mg/m³ 8 godzinach	TWA: 25 ppm 8 timer TWA: 94 mg/m³ 8 timer STEL: 37.5 ppm 15 minutter. STEL: 141 mg/m³ 15 minutter. Hud
Benzene	TRK-KZW: 4 ppm 15 Minuten TRK-KZW: 12.8 mg/m³ 15 Minuten Haut TRK-TMW: 1 ppm TRK-TMW: 3.2 mg/m³	TWA: 0.5 ppm 8 timer TWA: 1.6 mg/m³ 8 timer Hud	Haut/Peau TWA: 0.5 ppm 8 Stunden TWA: 1.6 mg/m³ 8 Stunden	TWA: 1.6 mg/m³ 8 godzinach	TWA: 1 ppm 8 timer TWA: 3 mg/m³ 8 timer STEL: 3 ppm 15 minutter. STEL: 6 mg/m³ 15 minutter.

Component	Bulgaria	Croatia	Ireland	Cyprus	Czech Republic
Ethylbenzene	TWA: 435 mg/m³ STEL : 545 mg/m³ Skin notation	kože TWA-GVI: 100 ppm 8 satima. TWA-GVI: 442 mg/m³ 8 satima. STEL-KGVI: 200 ppm 15 minutama. STEL-KGVI: 884 mg/m³ 15 minutama.	TWA: 100 ppm 8 hr. TWA: 442 mg/m³ 8 hr. STEL: 200 ppm 15 min STEL: 884 mg/m³ 15 min Skin	Skin-potential for cutaneous absorption STEL: 200 ppm STEL: 884 mg/m³ TWA: 100 ppm TWA: 442 mg/m³	TWA: 200 mg/m³ 8 hodinách. Potential for cutaneous absorption Ceiling: 500 mg/m³
Xylenes (o-, m-, p-	TWA: 50 ppm	kože	TWA: 50 ppm 8 hr.	Skin-potential for	TWA: 200 mg/m³ 8

isomers)	TWA: 221.0 mg/m³ STEL : 100 ppm STEL : 442 mg/m³ Skin notation	TWA-GVI: 50 ppm 8 satima. TWA-GVI: 221 mg/m³ 8 satima. STEL-KGVI: 100 ppm 15 minutama. STEL-KGVI: 442 mg/m³ 15 minutama.	TWA: 221 mg/m³ 8 hr. STEL: 100 ppm 15 min STEL: 442 mg/m³ 15 min Skin	cutaneous absorption STEL: 100 ppm STEL: 442 mg/m³ TWA: 50 ppm TWA: 221 mg/m³	hodinách. Potential for cutaneous absorption Ceiling: 400 mg/m³
Toluene	TWA: 50 ppm TWA: 192.0 mg/m³ STEL : 100 ppm STEL : 384.0 mg/m³ Skin notation	kože TWA-GVI: 50 ppm 8 satima. TWA-GVI: 192 mg/m³ 8 satima. STEL-KGVI: 100 ppm 15 minutama. STEL-KGVI: 384 mg/m³ 15 minutama.	TWA: 50 ppm 8 hr. TWA: 192 mg/m³ 8 hr. STEL: 384 mg/m³ 15 min STEL: 100 ppm 15 min Skin	Skin-potential for cutaneous absorption STEL: 100 ppm STEL: 384 mg/m³ TWA: 50 ppm TWA: 192 mg/m³	TWA: 200 mg/m³ 8 hodinách. Potential for cutaneous absorption Ceiling: 500 mg/m³
Benzene	TWA: 3.25 mg/m³ Skin notation	kože TWA-GVI: 1 ppm 8 satima. TWA-GVI: 3.25 mg/m³ 8 satima.	TWA: 1 ppm 8 hr. TWA: 3 mg/m³ 8 hr. STEL: 3 ppm 15 min STEL: 9 mg/m³ 15 min Skin	Skin-potential for cutaneous absorption TWA: 1 ppm TWA: 3.25 mg/m³	TWA: 3 mg/m³ 8 hodinách. Potential for cutaneous absorption Ceiling: 10 mg/m³

Component	Estonia	Gibraltar	Greece	Hungary	Iceland
Ethylbenzene	Nahk TWA: 100 ppm 8 tundides. TWA: 442 mg/m³ 8 tundides. STEL: 200 ppm 15 minutites. STEL: 884 mg/m³ 15 minutites. Ceiling: 0.01 ppm 5 min	Skin notation TWA: 100 ppm 8 hr TWA: 442 mg/m³ 8 hr STEL: 200 ppm 15 min STEL: 884 mg/m³ 15 min	STEL: 125 ppm STEL: 545 mg/m³ TWA: 100 ppm TWA: 435 mg/m³	STEL: 884 mg/m³ 15 percekben. CK TWA: 442 mg/m³ 8 órában. AK lehetséges borön keresztüli felszívódás	STEL: 200 ppm STEL: 884 mg/m³ TWA: 50 ppm 8 klukkustundum. TWA: 200 mg/m³ 8 klukkustundum. Skin notation Ceiling: 100 ppm Ceiling: 400 mg/m³
Xylenes (o-, m-, p-isomers)	Nahk TWA: 50 ppm 8 tundides. TWA: 221 mg/m³ 8 tundides. STEL: 100 ppm 15 minutites. STEL: 442 mg/m³ 15 minutites.	Skin notation TWA: 50 ppm 8 hr pure TWA: 221 mg/m³ 8 hr pure STEL: 100 ppm 15 min pure STEL: 442 mg/m³ 15 min pure	skin - potential for cutaneous absorption STEL: 150 ppm STEL: 650 mg/m³ TWA: 100 ppm TWA: 435 mg/m³	STEL: 442 mg/m³ 15 percekben. CK TWA: 221 mg/m³ 8 órában. AK lehetséges borön keresztüli felszívódás	STEL: 100 ppm STEL: 442 mg/m³ TWA: 25 ppm 8 klukkustundum. TWA: 109 mg/m³ 8 klukkustundum. Skin notation Ceiling: 50 ppm Ceiling: 218 mg/m³
Toluene	Nahk TWA: 50 ppm 8 tundides. TWA: 192 mg/m³ 8 tundides. STEL: 100 ppm 15 minutites. STEL: 384 mg/m³ 15 minutites.	Skin notation TWA: 50 ppm 8 hr TWA: 192 mg/m³ 8 hr STEL: 100 ppm 15 min STEL: 384 mg/m³ 15 min	skin - potential for cutaneous absorption STEL: 100 ppm STEL: 384 mg/m³ TWA: 50 ppm TWA: 192 mg/m³	STEL: 380 mg/m³ 15 percekben. CK TWA: 190 mg/m³ 8 órában. AK lehetséges borön keresztüli felszívódás	STEL: 50 ppm STEL: 188 mg/m³ TWA: 25 ppm 8 klukkustundum. TWA: 94 mg/m³ 8 klukkustundum. Skin notation Ceiling: 50 ppm Ceiling: 188 mg/m³
Benzene	Nahk TWA: 0.5 ppm 8 tundides. TWA: 1.5 mg/m³ 8 tundides. STEL: 3 ppm 15 minutites. STEL: 9 mg/m³ 15 minutites.		skin - potential for cutaneous absorption TWA: 1.0 ppm TWA: 3.19 mg/m³	lehetséges borön keresztüli felszívódás Ceiling: 3 mg/m³ MK	TWA: 0.5 ppm 8 klukkustundum. TWA: 1.6 mg/m³ 8 klukkustundum. Skin notation Ceiling: 1 ppm Ceiling: 3.2 mg/m³

Component	Latvia	Lithuania	Luxembourg	Malta	Romania
Ethylbenzene	skin - potential for cutaneous exposure STEL: 200 ppm STEL: 884 mg/m³ TWA: 100 ppm	TWA: 100 ppm IPRD TWA: 442 mg/m³ IPRD Oda STEL: 200 ppm STEL: 884 mg/m³	Possibility of significant uptake through the skin TWA: 100 ppm 8 Stunden TWA: 442 mg/m³ 8	possibility of significant uptake through the skin TWA: 100 ppm TWA: 442 mg/m³ STEL: 200 ppm 15	Skin notation TWA: 100 ppm 8 ore TWA: 442 mg/m³ 8 ore STEL: 200 ppm 15 minute

	TWA: 442 mg/m³		Stunden STEL: 200 ppm 15 Minuten STEL: 884 mg/m³ 15 Minuten	minuti STEL: 884 mg/m³ 15 minuti	STEL: 884 mg/m³ 15 minute
Xylenes (o-, m-, p-isomers)	skin - potential for cutaneous exposure STEL: 100 ppm STEL: 442 mg/m³ TWA: 50 ppm TWA: 221 mg/m³	TWA: 50 ppm IPRD TWA: 200 mg/m³ IPRD Oda STEL: 100 ppm STEL: 450 mg/m³	TWA: 50 ppm 8 Stunden TWA: 221 mg/m³ 8 Stunden STEL: 100 ppm 15 Minuten STEL: 442 mg/m³ 15 Minuten	possibility of significant uptake through the skin TWA: 50 ppm TWA: 221 mg/m³ STEL: 100 ppm 15 minuti STEL: 442 mg/m³ 15 minuti	Skin notation TWA: 50 ppm 8 ore TWA: 221 mg/m³ 8 ore STEL: 100 ppm 15 minute STEL: 442 mg/m³ 15 minute
Toluene	skin - potential for cutaneous exposure STEL: 40 ppm STEL: 150 mg/m³ TWA: 14 ppm TWA: 50 mg/m³	TWA: 50 ppm IPRD TWA: 192 mg/m³ IPRD Oda STEL: 100 ppm STEL: 384 mg/m³	Possibility of significant uptake through the skin TWA: 50 ppm 8 Stunden TWA: 192 mg/m³ 8 Stunden STEL: 100 ppm 15 Minuten STEL: 384 mg/m³ 15 Minuten	possibility of significant uptake through the skin TWA: 50 ppm TWA: 192 mg/m³ STEL: 100 ppm 15 minuti STEL: 384 mg/m³ 15 minuti	Skin notation TWA: 50 ppm 8 ore TWA: 192 mg/m³ 8 ore STEL: 100 ppm 15 minute STEL: 384 mg/m³ 15 minute
Benzene	skin - potential for cutaneous exposure TWA: 1 ppm TWA: 3.25 mg/m³	TWA: 1 ppm IPRD TWA: 3.25 mg/m³ IPRD Oda STEL: 6 ppm STEL: 19 mg/m³	TWA: 1 ppm 8 Stunden TWA: 3.25 mg/m³ 8 Stunden		Skin notation TWA: 1 ppm 8 ore TWA: 3.25 mg/m³ 8 ore

Component	Russia	Slovak Republic	Slovenia	Sweden	Turkey
Ethylbenzene	TWA: 50 mg/m³ STEL: 150 mg/m³ vapor	Ceiling: 884 mg/m³ Potential for cutaneous absorption TWA: 100 ppm TWA: 442 mg/m³	TWA: 100 ppm 8 urah TWA: 442 mg/m³ 8 urah Koža STEL: 200 ppm 15 minutah STEL: 884 mg/m³ 15 minutah	STV: 100 ppm 15 minuter STV: 450 mg/m³ 15 minuter LLV: 50 ppm 8 timmar. LLV: 200 mg/m³ 8 timmar.	Deri TWA: 100 ppm 8 saat TWA: 442 mg/m³ 8 saat STEL: 200 ppm 15 dakika STEL: 884 mg/m³ 15 dakika
Xylenes (o-, m-, p-isomers)	TWA: 50 mg/m³ 2-,3- and 4- isomers STEL: 150 mg/m³ vapor	Ceiling: 442 mg/m³ Potential for cutaneous absorption TWA: 50 ppm TWA: 221 mg/m³	TWA: 50 ppm 8 urah TWA: 221 mg/m³ 8 urah Koža STEL: 100 ppm 15 minutah STEL: 442 mg/m³ 15 minutah	STV: 100 ppm 15 minuter STV: 442 mg/m³ 15 minuter LLV: 50 ppm 8 timmar. LLV: 221 mg/m³ 8 timmar. Hud	Deri TWA: 50 ppm 8 saat TWA: 221 mg/m³ 8 saat STEL: 100 ppm 15 dakika STEL: 442 mg/m³ 15 dakika
Toluene	TWA: 50 mg/m³ STEL: 150 mg/m³ vapor	Ceiling: 384 mg/m³ Potential for cutaneous absorption TWA: 50 ppm TWA: 192 mg/m³	TWA: 50 ppm 8 urah TWA: 192 mg/m³ 8 urah Koža STEL: 200 ppm 15 minutah STEL: 384 mg/m³ 15 minutah	STV: 100 ppm 15 minuter STV: 384 mg/m³ 15 minuter LLV: 50 ppm 8 timmar. LLV: 192 mg/m³ 8 timmar. Hud	Deri TWA: 50 ppm 8 saat TWA: 192 mg/m³ 8 saat STEL: 100 ppm 15 dakika STEL: 384 mg/m³ 15 dakika
Benzene	TWA: 5 mg/m³ Skin notation STEL: 15 mg/m³ vapor	TWA: 1.0 ppm 8 hodinách TWA: 3.25 mg/m³ 8 hodinách Potential for cutaneous absorption STEL: 5.0 ppm 15 minútach STEL: 16.25 mg/m³ 15 minútach	TWA: 1 ppm 8 urah TWA: 3.25 mg/m³ 8 urah Koža STEL: 4 ppm 15 minutah STEL: 13 mg/m³ 15 minutah	STV: 3 ppm 15 minuter STV: 9 mg/m³ 15 minuter LLV: 0.5 ppm 8 timmar. LLV: 1.5 mg/m³ 8 timmar. Hud	

Biological limit values

Component	European Union	United Kingdom	France	Spain	Germany
Ethylbenzene			Mandelic acid: 1500	Mandelic acid plus	Mandelic acid plus

			mg/g creatinine urine end of shift at end of workweek	Phenylglyoxylic acid: 700 mg/g Creatinine urine end of workweek	Phenylglyoxylic acid: 300 mg/g urine (end of shift)
Xylenes (o-, m-, p-isomers)		Methyl hippuric acid: 650 mmol/mol creatinine urine Post shift	Methylhippuric acid: 1500 mg/g creatinine urine end of shift	Methylhippuric acids: 1 g/g Creatinine urine end of shift	Xylene: 1.5 mg/L whole blood (end of shift all isomers) Methylhippuric(tolur-)acid: 2000 mg/L urine (end of shift all isomers)
Toluene			Toluene: 1 mg/L blood end of shift Hippuric acid: 2500 mg/g creatinine urine end of shift	o-Cresol: 0.5 mg/L urine end of shift Hippuric acid: 1.6 g/g Creatinine urine end of shift Toluene: 0.05 mg/L blood start of last shift of workweek	Toluene: 600 µg/L whole blood (end of shift) o-Cresol: 1.5 mg/L urine (end of several shifts after hydrolysis; for long-term exposures)
Benzene			Muconic acid: 5 mg/L urine end of shift	S-Phenylmercapturic acid: 0.045 mg/g urine end of exposure or end of shift trans,trans-Muconic acid: 2 mg/L urine end of exposure or end of shift Total benzene: 5 µg/L blood end of exposure or end of shift	

Component	Italy	Finland	Denmark	Bulgaria	Romania
Ethylbenzene		Mandelic acid: 5.2 mmol/L urine end of shift at end of workweek.		Mandelic acid and Phenylglyoxylic acid - together: 2000 mg/g Creatinine urine at the end of exposure or end of shift Possible significant absorption through the skin	Mandelic acid: 1.5 g/g Creatinine urine end of work week
Xylenes (o-, m-, p-isomers)		Methylhippuric acid: 5.0 mmol/L urine end of shift.			Methylhippuric acid: 3 g/L urine end of shift
Toluene		Toluene concentrated: 500 nmol/L blood prior to shift.		Hippuric acid: 1.6 mmol/mmol Creatinine urine at the end of exposure or end of shift	Hippuric acid: 2 g/L urine end of shift o-Cresol: 3 mg/L urine end of shift
Benzene				Trans, trans-Muconic acid: 2.0 mg/L urine at the end of exposure or end of shift Possible significant absorption through the skin S-Phenyl Mercapturic acid: 0.045 mg/g Creatinine urine at the end of exposure or end of shift Possible significant absorption through the skin	S-Phenylmercapturic acid: 25 µg/g Creatinine urine end of shift total Phenols: 50 mg/L urine end of shift

Component	Gibraltar	Latvia	Slovak Republic	Luxembourg	Turkey
Ethylbenzene			2 and 4-Ethylphenol: 12 mg/L urine end of exposure or work shift also after all work shifts for long-term exposure Mandelic acid and phenylglycolic acid: 1600 mg/L urine end of exposure or work shift		

			also after all work shifts for long-term exposure		
Xylenes (o-, m-, p-isomers)			Xylene: 1.5 mg/L blood end of exposure or work shift all isomers Methylhippuric acid: 2000 mg/L urine end of exposure or work shift		
Toluene		Hippuric acid: 1.6 g/g Creatinine urine end of shift Toluene: 0.05 mg/l blood end of shift	Toluene: 600 µg/L blood end of exposure or work shift o-Cresol: 1.5 mg/L urine after all work shifts for long-term exposure o-Cresol: 1.5 mg/L urine end of exposure or work shift Hippuric acid: 1600 mg/g creatinine end of exposure or work shift		
Benzene		Phenol: 25 µg/g Creatinine urine end of shift			

Monitoring methods
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

Derived No Effect Level (DNEL) No information available

Route of exposure	Acute effects (local)	Acute effects (systemic)	Chronic effects (local)	Chronic effects (systemic)
Oral				
Dermal				
Inhalation				

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Engineering Measures
Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.
Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

Personal protective equipment

Eye Protection Safety glasses with side-shields (European standard - EN 166)
Hand Protection Protective gloves

Glove material	Breakthrough time	Glove thickness	EU standard	Glove comments
Disposable gloves	See manufacturers recommendations	-	EN 374	(minimum requirement)

Skin and body protection Long sleeved clothing Apron Impervious gloves

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

Respiratory Protection When workers are facing concentrations above the exposure limit they must use

	appropriate certified respirators. To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly
Large scale/emergency use	In case of insufficient ventilation wear suitable respiratory equipment
Small scale/Laboratory use	Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced. When RPE is used a face piece Fit Test should be conducted
Hygiene Measures	When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing.
Environmental exposure controls	No information available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance	Clear, Colorless	
Physical State	Liquid	
Odor	aromatic	
Odor Threshold	No data available	
pH	No data available	
Melting Point/Range	-47.2 °C / -53 °F	
Softening Point	No data available	
Boiling Point/Range	136.7 - 143.3 °C / 278 - 290 °F	
Flash Point	27.7 °C / 82 °F	**Method -** No information available
Evaporation Rate	No information available	
Flammability (solid,gas)	No information available	
Explosion Limits	**Lower** 1.1 vol % **Upper** 7.0 vol %	
Vapor Pressure	9 mmHg @ 25 °C	
Vapor Density	3.66 (Air = 1.0)	(Air = 1.0)
Specific Gravity / Density	No data available 0.87	
Bulk Density	No data available	
Water Solubility	No information available	
Solubility in other solvents	No information available	

Partition Coefficient (n-octanol/water)

Component	**log Pow**
Ethylbenzene	3.118
Xylenes (o-, m-, p- isomers)	3.15
Toluene	2.65
Benzene	1.83

Autoignition Temperature	527 °C / 980.6 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Formula	C8H10
Molecular Weight	106.17

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

None known, based on information available

10.2. Chemical stability

Stable under normal conditions

10.3. Possibility of hazardous reactions

Hazardous Polymerization Hazardous polymerization does not occur.
Hazardous Reactions No information available.

10.4. Conditions to avoid

Incompatible products. Heat, flames and sparks.

10.5. Incompatible materials

Strong oxidizing agents. Strong acids.

10.6. Hazardous decomposition products

Carbon monoxide (CO). Carbon dioxide (CO_2). Hydrocarbons. Aldehydes.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information No acute toxicity information is available for this product

(a) acute toxicity;
Oral No data available
Dermal No data available
Inhalation No data available

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylbenzene	3500 mg/kg (Rat)	15400 mg/kg (Rabbit)	17.2 mg/L (Rat) 4 h
Xylenes (o-, m-, p- isomers)	3500 mg/kg (Rat)	4350 mg/kg (Rabbit) 1700 mg/kg (Rabbit)	29.08 mg/L [MOE Risk Assessment Vol.1, 2002]
Toluene	> 5000 mg/kg (Rat)	12000 mg/kg (Rabbit)	26700 ppm (Rat) 1 h
Benzene	810 mg/kg (Rat) 1800 mg/kg (Rat)	8200 mg/kg (Rabbit)	44.66 mg/L (Rat) 4 h

(b) skin corrosion/irritation; No data available

(c) serious eye damage/irritation; No data available

(d) respiratory or skin sensitization;
Respiratory No data available
Skin No data available

(e) germ cell mutagenicity; No data available

(f) carcinogenicity; No data available

The table below indicates whether each agency has listed any ingredient as a carcinogen

Component	EU	UK	Germany	IARC
Ethylbenzene				Group 2B
Benzene	Carc Cat. 1A		Cat. 1	Group 1

(g) reproductive toxicity; No data available
Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.
Developmental Effects Developmental effects have occurred in experimental animals.
Teratogenicity Teratogenic effects have occurred in experimental animals.

(h) STOT-single exposure; No data available

(i) STOT-repeated exposure; No data available

Target Organs Eyes, Skin, Central nervous system (CNS), Liver, Kidney, Respiratory system.

(j) aspiration hazard; No data available

Other Adverse Effects Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecotoxicity effects Do not empty into drains.

Component	Freshwater Fish	Water Flea	Freshwater Algae	Microtox
Ethylbenzene	9.6 mg/L LC50 96 h 9.1 - 15.6 mg/L LC50 96 h 32 mg/L LC50 96 h 7.55 - 11 mg/L LC50 96 h 4.2 mg/L LC50 96 h 11.0 - 18.0 mg/L LC50 96 h	1.8 - 2.4 mg/L EC50 48 h	2.6 - 11.3 mg/L EC50 72 h 438 mg/L EC50 > 96 h 4.6 mg/L EC50 = 72 h 1.7 - 7.6 mg/L EC50 96 h	EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h
Xylenes (o-, m-, p- isomers)	30.26 - 40.75 mg/L LC50 96 h 780 mg/L LC50 96 h 23.53 - 29.97 mg/L LC50 96 h 7.711 - 9.591 mg/L LC50 96 h 19 mg/L LC50 96 h 13.1 - 16.5 mg/L LC50 96 h 13.5 - 17.3 mg/L LC50 96 h 2.661 - 4.093 mg/L LC50 96 h 13.4 mg/L LC50 96 h	0.6 mg/L LC50 = 48 h 3.82 mg/L EC50 = 48 h		EC50 = 0.0084 mg/L 24 h
Toluene	50-70 mg/L LC50 96 h 5-7 mg/L LC50 96 h 15-19 mg/L LC50 96 h 28 mg/L LC50 96 h 12 mg/L LC50 96 h	11.5 mg/L EC50 = 48 h 5.46 - 9.83 mg/L EC50 48 h	12.5 mg/L EC50 = 72 h 433 mg/L EC50 > 96 h	EC50 = 19.7 mg/L 30 min
Benzene	70000 - 142000 µg/L LC50 96 h 22330 - 41160 µg/L LC50 96 h 28.6 mg/L LC50 96 h 22.49 mg/L LC50 96 h 5.3 mg/L LC50 96 h 10.7 - 14.7 mg/L LC50 96 h	10 mg/L EC50 = 48 h 8.76 - 15.6 mg/L EC50 48 h	29 mg/L EC50 = 72 h	

12.2. Persistence and degradability No information available

Component	Degradability
Toluene 108-88-3 (0 - 0.5)	86% (20d)

12.3. Bioaccumulative potential No information available

Component	log Pow	Bioconcentration factor (BCF)
Ethylbenzene	3.118	15
Xylenes (o-, m-, p- isomers)	3.15	0.6 - 15
Toluene	2.65	90
Benzene	1.83	3.5 - 4.4

12.4. Mobility in soil .

12.5. Results of PBT and vPvB assessment No data available for assessment.

12.6. Other adverse effects

Endocrine Disruptor Information	This product does not contain any known or suspected endocrine disruptors
Persistent Organic Pollutant	This product does not contain any known or suspected substance
Ozone Depletion Potential	This product does not contain any known or suspected substance

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from Residues / Unused Products	Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.
Contaminated Packaging	Empty remaining contents. Dispose of in accordance with local regulations. Do not re-use empty containers.
European Waste Catalogue (EWC)	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.
Other Information	Waste codes should be assigned by the user based on the application for which the product was used.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO

14.1. UN number	UN1307
14.2. UN proper shipping name	XYLENES
14.3. Transport hazard class(es)	3
14.4. Packing group	III

ADR

14.1. UN number	UN1307
14.2. UN proper shipping name	XYLENES
14.3. Transport hazard class(es)	3
14.4. Packing group	III

IATA

14.1. UN number	UN1307
14.2. UN proper shipping name	XYLENES
14.3. Transport hazard class(es)	3
14.4. Packing group	III

14.5. Environmental hazards	No hazards identified
14.6. Special precautions for user	No special precautions required
14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable, packaged goods

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories Australia X = listed China Canada The product is classified and labeled according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC Europe TSCA Korea Philippines Japan

Component	EINECS	ELINCS	NLP	TSCA	DSL	NDSL	PICCS	ENCS	IECSC	AICS	KECL
Ethylbenzene	202-849-4	-		X	X	-	X	X	X	X	X
Xylenes (o-, m-, p- isomers)	215-535-7	-		X	X	-	X	X	X	X	X

Toluene	203-625-9	-		X	X	-	X	X	X	X	X
Benzene	200-753-7	-		X	X	-	X	X	X	X	X

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Toluene		Use restricted. See item 48. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details)	
Benzene		Use restricted. See item 5. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) Use restricted. See item 28. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details) Use restricted. See item 29. (see *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006R1907:EN:NOT* for restriction details)	

National Regulations

Component	Germany - Water Classification (VwVwS)	Germany - TA-Luft Class
Ethylbenzene	WGK 1	
Xylenes (o-, m-, p- isomers)	WGK 2	
Toluene	WGK 2	
Benzene	WGK 3	Krebserzeugende Stoffe - Class III : 1 mg/m³ (Massenkonzentration)

Component	France - INRS (Tables of occupational diseases)
Ethylbenzene	Tableaux des maladies professionnelles (TMP) - RG 84
Xylenes (o-, m-, p- isomers)	Tableaux des maladies professionnelles (TMP) - RG 4bis,RG 84
Toluene	Tableaux des maladies professionnelles (TMP) - RG 4bis,RG 84
Benzene	Tableaux des maladies professionnelles (TMP) - RG 4,RG 4bis,RG 84

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.
Take note of Dir 94/33/EC on the protection of young people at work
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has not been conducted

SECTION 16: OTHER INFORMATION

Full text of R-phrases referred to under sections 2 and 3
R10 - Flammable
R11 - Highly flammable
R20 - Harmful by inhalation
R38 - Irritating to skin
R45 - May cause cancer
R46 - May cause heritable genetic damage
R63 - Possible risk of harm to the unborn child
R65 - Harmful: may cause lung damage if swallowed
R67 - Vapors may cause drowsiness and dizziness

R20/21 - Harmful by inhalation and in contact with skin
R36/38 - Irritating to eyes and skin
R48/20 - Harmful: danger of serious damage to health by prolonged exposure through inhalation
R48/23/24/25 - Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed

Full text of H-Statements referred to under sections 2 and 3
H226 - Flammable liquid and vapor
H225 - Highly flammable liquid and vapor
H312 - Harmful in contact with skin
H332 - Harmful if inhaled
H315 - Causes skin irritation
H304 - May be fatal if swallowed and enters airways
H373 - May cause damage to organs through prolonged or repeated exposure

Legend

CAS - Chemical Abstracts Service
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
IECSC - Chinese Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
ENCS - Japanese Existing and New Chemical Substances
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

WEL - Workplace Exposure Limit
ACGIH - American Conference of Governmental Industrial Hygienists
DNEL - Derived No Effect Level
RPE - Respiratory Protective Equipment
LC50 - Lethal Concentration 50%
NOEC - No Observed Effect Concentration
PBT - Persistent, Bioaccumulative, Toxic
TWA - Time Weighted Average
IARC - International Agency for Research on Cancer
PNEC - Predicted No Effect Concentration
LD50 - Lethal Dose 50%
EC50 - Effective Concentration 50%
POW - Partition coefficient Octanol:Water
vPvB - very Persistent, very Bioaccumulative

ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road
IMO/IMDG - International Maritime Organization/International Maritime Dangerous Goods Code
OECD - Organisation for Economic Co-operation and Development
BCF - Bioconcentration factor
ICAO/IATA - International Civil Aviation Organization/International Air Transport Association
MARPOL - International Convention for the Prevention of Pollution from Ships
ATE - Acute Toxicity Estimate
VOC - Volatile Organic Compounds

Key literature references and sources for data
Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

Training Advice
Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

Creation Date	13-Feb-2015
Revision Date	21-Feb-2014
Revision Summary	Not applicable.

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer
The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet

SAFETY DATA SHEET

Version 5.8
Revision Date 10/12/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Zinc
Product Number	:	96454
Brand	:	Sigma-Aldrich
CAS-No.	:	7440-66-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Combustible dust,
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word	Warning
Hazard statement(s)	
	May form combustible dust concentrations in air
H410	Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)	
P273	Avoid release to the environment.
P391	Collect spillage.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : Zn
Molecular weight : 65.39 g/mol

Hazardous components

Component		Classification	Concentration
Zinc powder (stabilized)			
CAS-No. EC-No. Index-No.	7440-66-6 231-175-3 030-001-01-9	Aquatic Acute 1; Aquatic Chronic 1; H410	<= 100 %
Zinc oxide			
CAS-No. EC-No. Index-No.	1314-13-2 215-222-5 030-013-00-7	Aquatic Acute 1; Aquatic Chronic 1; H410	>= 5 - < 10 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Special powder against metal fire Dry sandUse water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable extinguishing media
Water

5.2 Special hazards arising from the substance or mixture

Zinc/zinc oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Zinc oxide	1314-13-2	TWA	2.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	metal fume fever		
		STEL	10.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		metal fume fever		

		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	15.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	15.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: grey
b)	Odour	odourless
c)	Odour Threshold	No data available
d)	pH	Not applicable
e)	Melting point/freezing point	Melting point/range: 420 °C (788 °F) - lit.
f)	Initial boiling point and boiling range	907 °C (1,665 °F) - lit.
g)	Flash point	Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	May form combustible dust concentrations in air
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	Not applicable
l)	Vapour density	No data available
m)	Relative density	7.133 g/mL at 25 °C (77 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	Not applicable
p)	Auto-ignition temperature	does not ignite
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	During processing, dust may form explosive mixture in air.
t)	Oxidizing properties	No data available

9.2 Other safety information

Bulk density	1.8 - 3.2 kg/m3

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Dust may form explosive mixture in air.

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Acids and bases

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available (Zinc powder (stabilized))

Inhalation: No data available (Zinc powder (stabilized))

Dermal: No data available (Zinc powder (stabilized))

No data available (Zinc powder (stabilized))

Skin corrosion/irritation
No data available (Zinc powder (stabilized))

Serious eye damage/eye irritation
No data available (Zinc powder (stabilized))

Respiratory or skin sensitisation
Did not cause sensitisation on laboratory animals. (Zinc powder (stabilized))

Germ cell mutagenicity
No data available (Zinc powder (stabilized))

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available (Zinc powder (stabilized))

No data available (Zinc powder (stabilized))

Specific target organ toxicity - single exposure
No data available (Zinc powder (stabilized))

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available (Zinc powder (stabilized))

Additional Information
RTECS: ZG8600000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Effects due to ingestion may include:, chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness, Contact with eyes or skin may cause:, Irritation (Zinc powder (stabilized))

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Cyprinus carpio (Carp) - 450 µg/l - 96 h (Zinc powder (stabilized))
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h (Zinc powder (stabilized))
	mortality NOEC - Daphnia (water flea) - 0.101 - 0.14 mg/l - 7 d (Zinc powder (stabilized))

12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Bioaccumulation	Algae - 7 d at 16 °C - 5 µg/l (Zinc powder (stabilized))
	Bioconcentration factor (BCF): 466

12.4 Mobility in soil

No data available (Zinc powder (stabilized))

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Zinc powder (stabilized))
Reportable Quantity (RQ): 1020 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc powder (stabilized))
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Zinc powder (stabilized))

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Zinc oxide	1314-13-2	2007-03-01
Zinc powder (stabilized)	7440-66-6	1993-04-24

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24
Zinc oxide	1314-13-2	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24
Zinc oxide	1314-13-2	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24
Zinc oxide	1314-13-2	2007-03-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

	May form combustible dust concentrations in air
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.8 Revision Date: 10/12/2015 Print Date: 05/01/2016

ATTACHMENT J

Jobsite Safety Inspection Checklist

LANGAN

LANGAN

JOBSITE SAFETY INSPECTION CHECKLIST

Client: _____ Inspection Date: _____

Site: _____ Inspector: _____

Employees: _____

Notes:_____

Check one of the following: **A:** Acceptable **NA**: Not Applicable **D**: Deficiency

	A	NA	D	Remarks
GENERAL				
Appropriate PPE being worn by Langan employees and subcontractors?				
Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?				
Air monitoring readings recorded on the air monitoring data sheet/field log book?				
Incident reporting procedures known?				
Site security an issue?				
Vehicle /pedestrian traffic issue?				
Adequate size/type fire extinguisher supplied?				
Evidence that drilling operator is responsible for the safety of his rig.				
First Aid kit available?				
PERSONAL PROTECTIVE EQUIPMENT				
Eye Protection?				
Head protection?				
Safety Shoes?				
Safety vests?				
Hand protection?				
Other?				
Deficiencies??				
HOUSEKEEPING				
Work area kept clean/tidy to minimize potential hazards?				
Waste being disposed of quickly and properly				
Adequate lighting for job?				
Portable water available?				
HAND TOOLS				
Are tools in good condition and properly used? (INSPECT)				
Are proper tools being used?				
Are tools safety stored when not in use?				
Have tools been inspected prior to use?				
Are employees familiar with using tools?				
Is additional PPE required for tools? Available?				
POWER TOOLS				
Are tools in good condition and properly used? (INSPECT)				
Are tools properly grounded?				
Safety guards in place and used correctly?				
Competent instruction / supervision?				
Cords include in inspection?				

HAZWOPER				
Employees have current 40-hr./8-hr./Supervisor HAZWOPER training?				
Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?				
Respiratory protection readily available?				
Subcontract workers have current 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?				
Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?				
Subcontract workers have respirators readily available?				
HEALTH & SAFETY PLAN				
HASP available on site for inspection?				
Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and subcontractors?				
Hospital route map with directions posted on site?				
Emergency Notification List posted on site?				
Personnel trained in CPR/First Aid on site?				
MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?				
Project site safe practices ("Standing Orders") posted?				
Health & Safety Incident Report forms available?				
Decontamination procedures being followed as outlined in HASP?				
UNDERGROUND UTILITY				
Mark outs of underground utilities done prior to initiating any subsurface activities?				
Underground utilities located and authorities contacted before digging?				
Visually observed mark-outs?				
Is subsurface work within three feet of underground utilities?				
- Is so, is or was soft dig techniques used?				
Drilling performed in areas free from underground utilities?				
EXCAVATION / TRENCH				
Are excavations/trenches over 5 feet deep sloped, shored or a trench box used?				
Operations supervised by a Competent Person?				
Is Competent Person preforming daily inspections of excavation/trench?				
Adequate barricades in place?				
Have underground utilities been identified?				
Ladders / means of egress in trench with 25-foot of every worker?				
Has PE designed or approved protective system?				
Excavated material and other objects placed more than 2 feet away from excavation edge?				
Public protected from exposure to open excavation?				
CONFINED / PERMIT-ENTRY CONFINED SPACE				
People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?				
Confined space entry permit is completed and posted?				
All persons knowledgeable about the conditions and characteristics of the confined space?				
All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?				
Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?				
Attendant and/or supervisor certified in basic first aid and CPR?				
Confined space atmosphere checked before entry and continuously while the work is going on?				
Results of confined space atmosphere testing recorded?				
Evidence of coordination with off-site rescue services to perform entry rescue, if needed?				
ELECTRICAL SAFETY				
Equipment at least 10 feet from overhead power lines?				
Is equipment grounded?				
GFCI used and tested where required?				
Are extension cords rated for this work being used and are they properly maintained?				
Electrical dangers posted at site?				

FLAMMABLE LIQUIDS				
Are flammable liquids used at site?				
Are flammable liquids stored in appropriate containers?				
Are flammable liquids kept away from combustion sources?				
Do flammable liquid containers have warning labels?				
LADDERS				
Are ladders used at site?				
Were ladders inspected prior to use?				
Are ladders in good working condition?				
Are ladders secured to prevent slipping, sliding or falling?				
Do side rails extend three feet above top of landing area?				
Are top two steps of stepladders being used?				
Is extension on ladder facing out?				
Are ladders sufficient for task?				
Are ladders sufficient for task?				

Unsafe acts observed? _____

Additional remarks _____

Notes:_____

Distribution: Project Manager - Name: _____
Health & Safety Officer - Name: _____
Health & Safety Manager- Name: Anthony Moffa, CHMM

Q:\Other\HealthandSafety\GenericAppendixAJobsiteSafetyInspectionChecklist

ATTACHMENT K

Langan Guidelines

LANGAN

ATTACHMENT K

Langan Guidelines

GENERAL

- No smoking, eating, or drinking in this work zone.
- Upon leaving the work zone, personnel will thoroughly wash their hands and face.
- Minimize contact with contaminated materials through proper planning of work areas and decontamination areas, and by following proper procedures. Do not place equipment on the ground. Do not sit on contaminated materials.
- No open flames in the work zone.
- Only properly trained and equipped personnel are permitted to work in potentially contaminated areas.
- Always use the appropriate level of personal protective equipment (PPE).
- Maintain close contact with your buddy in the work zone
- Contaminated material will be contained in the Exclusion Zone (EZ).
- Report any unusual conditions.
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible.
- The number of personnel and equipment in the work zone will be kept to an essential minimum.
- Be alert to the symptoms of fatigue and heat/cold stress, and their effects on the normal caution and judgment of personnel.
- Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved quickly by the site HSO.

TOOLS AND HEAVY EQUIPMENT

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other device not specifically designed to carrying passengers.
- Loose-fitting clothing or loose long hair is prohibited around moving machinery.
- Ensure that heavy equipment operators and all other personnel in the work zone are using the same hand signals to communicate.
- Drilling/excavating within 10 feet in any direction of overhead power lines is prohibited.
- The locations of all underground utilities must be identified and marked out prior to initiating any subsurface activities.
- Check to insure that the equipment operator has lowered all blades and buckets to the ground before shutting off the vehicle.
- If the equipment has an emergency stop device, have the operator show all personnel its location and how to activate it.
- Help the operator ensure adequate clearances when the equipment must negotiate in tight quarters; serve as a signalman to direct backing as necessary.
- Ensure that all heavy equipment that is used in the Exclusion Zone is kept in that zone until the job is done, and that such equipment is completely decontaminated before moving it into the clean area of the work zone.
- Samplers must not reach into or get near rotating equipment such as the drill rig. If personnel must work near any tools that could rotate, the equipment operator must completely shut down the rig prior to initiating such work. It may be necessary to use a remote sampling device.

APPENDIX F

Quality Assurance Project Plan

LANGAN

QUALITY ASSURANCE PROJECT PLAN

for

130 SAINT FELIX STREET SITE
BROOKLYN, NEW YORK
NYSDEC BCP No. C224306

Prepared For:

130 Saint Felix Street LLC
432 Park Avenue South, 2nd Floor
New York, New York 11711

Prepared By:

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
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May 2024
100842301

LANGAN

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1.0 PROJECT DESCRIPTION

1.1 Introduction

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) has prepared this Quality Assurance Project Plan (QAPP) on behalf of 130 Saint Felix Street LLC (the Volunteer) for the property at 130 Saint Felix Street located in Brooklyn, New York (portion of Tax Block 2111, Lot 40) in the Fort Greene neighborhood of Brooklyn, New York (the Site). A Site Location Map is included as Figure 1.

This QAPP specifies analytical methods to be used to ensure that data collected during the Remedial Action (RA) are precise, accurate, representative, comparable, complete, and meet the sensitivity requirements of the project.

1.2 Project Objectives

The Remedial Action Work Plan (RAWP) covers earthwork to be completed during construction of the proposed development at the site. A Construction Health and Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP) for the protection of on-site workers, the community, and the environment has been developed and will be implemented during remediation and construction activities. These objectives have been established in order to meet standards that will protect public health and the environment for the site.

This QAPP addresses sampling and analytical methods that will be necessary in support of remedial activities. These objectives have been established in order to meet standards that will protect public health and the environment for the site.

1.3 Scope of Work

The specific scope of work covered in this QAPP includes any confirmation and documentation sampling that will occur during implementation of the RAWP. The RAWP requires collection of documentation and confirmation soil samples to assess potential residual contamination surrounding contaminated non-native material. The selected remedy will include the following elements:

- Development and implementation of a CHASP and CAMP for the protection of on-Site workers, community/residents, and the environment during remediation and construction activities.
- Construction of the support of excavation (SOE) system to facilitate the combined Track 2 and Track 4 portions of the remediation.
- Excavation, stockpiling, off-Site transport, and disposal of all soil that exceeds the Track 2 RRSCOs as defined by 6 NYCRR Part 375-6.8(b) to el 39 NAVD88 (corresponding to between 7 and 10.5 feet bgs) across approximately 84% of the Site footprint within the Track 2 portion of the Site based on the 2015 SI and 2021 RI data and to el 43 NAVD88 (corresponding to 2 feet bgs) across the remaining 16% of the Site footprint for construction of a loading dock and building foundation elements within the Track 4 portion of the Site.
- Collection and analysis of: confirmation soil samples from the Track 2 portion of the Site at the remedial elevation of el 39 NAVD88 (between 7 and 10.5 feet bgs), in accordance with DER-10 to confirm if the Track 2 RRSCOs were achieved; documentation soil samples in the Track 2 portion of the Site where overall construction excavation depths are greater than 15 feet bgs and the Track 2 RRSCOs were not achieved in order to document any remaining exceedances that may be present below this depth; and documentation soil samples in the Track 4 portion of the Site to document soil quality remaining at the Site. If the results of the confirmation soil samples identify Track 2 SCO exceedances, additional samples will be taken in 2 foot intervals down to the planned depth of soil excavation or 15 feet bgs to determine the depth at which Track 2 SCOs can be achieved.
- Importation and backfilling of remediated areas and placement of additional fill as necessary to raise the remedial excavations areas to development grade with material meeting the RRSCOs, recycled concrete aggregate (RCA), or virgin, native crushed stone.
- Reuse of Site soil meeting the RRSCOs to raise Site grade, as needed.
- As part of the Track 4 portion of the remedy, installation of an engineered composite cover system, including the concrete-paved loading dock.
- Completion of a survey to document the extents of the Track 2 remediation, the Track 4 remediation, and the composite cover system.

- Establishment of use restrictions including prohibitions on the use of groundwater from the Site and prohibitions on sensitive Site uses, such as farming or vegetable gardening, to eliminate future exposure pathways.
- Establishment of an approved SMP to ensure long-term management of engineering and institutional controls, including the performance of periodic inspections and certification that the controls are performing as they were intended.
- Recording of an Environmental Easement (EE) to memorialize the remedial action and the engineering and institutional controls to ensure that future owners of the Site continue to maintain these controls as required.

2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall objective is to prevent additional environmental impacts to site media (soil) by removal of soil associated with the contaminated fill material as needed for construction of building elements.

DQOs for sampling activities are determined by evaluating five factors:

- Data needs and uses: The types of data required and how the data will be used after it is obtained.
- Parameters of Interest: The types of chemical or physical parameters required for the intended use.
- Level of Concern: Levels of constituents, which may require remedial actions or further investigations.
- Required Analytical Level: The level of data quality, data precision, and quality assurance/quality control (QA/QC) documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The quality assurance and quality control objectives for all measurement data include:

- Precision – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- Accuracy – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil samples, accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.
- Representativeness – expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is accomplished by following all applicable methods, laboratory-issued standard operating procedures (SOPs), the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.
- Completeness – the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.
- Comparability – expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis as documented in the QAPP, using standard reporting units and reporting formats, and data validation.

- Sensitivity – the ability of the instrument or method to detect target analytes at the levels of interest. The project manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Implementation of the RAWP will be overseen by Langan for 130 Saint Felix Street LLC. The environmental consultant will also arrange data analysis and reporting tasks. The analytical services will be performed by an Environmental Laboratory Approval Program (ELAP)-certified laboratory. Data validation services will be performed by approved data validation contractor(s).

For the required sampling as stated in the RAWP, sampling will be conducted by Langan, the analytical services will be performed by Alpha Analytical, Inc. of Mansfield, MA. (New York State Department of Health [NYSDOH] ELAP certification number 11148 [Westboro Laboratory] and 11627 [Mansfield Laboratory]). Data validation services will be performed by Joseph Conboy; résumé attached (Attachment A).

Key contacts for this project are as follows:

130 Saint Felix LLC	Bryan Kelly Telephone: (212) 716-2502
Langan Project Manager:	Jessica Friscia Telephone: (973) 560-4900
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Langan Remedial Engineer:	Ron Boyer Telephone: (973) 560-4900
Program Quality Assurance Monitor:	Lauren Kott Telephone: (973) 560-4900
Data Validator:	Joseph Conboy Telephone: (215) 845-8985
Laboratory Representative:	Alpha Analytical, Inc. Ben Rao Telephone: (201) 847-9100

4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA

The overall quality assurance objective is to develop and implement procedures for sampling, laboratory analysis, field measurements, and reporting that will provide data of sufficient quality to evaluate soil impacts at the site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the site. Quality assurance objectives are usually expressed in terms of accuracy or bias, sensitivity, completeness, representativeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

Precision

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates. Laboratory precision and sample heterogeneity also contribute to the uncertainty of field duplicate measurements. This uncertainty is taken into account during the data assessment process. For field duplicates, results less than 2x the reporting limit (RL) meet the precision criteria if the absolute difference is less than ±2X the RL. For results greater than 2X the RL, the acceptance criteria is a relative percent difference (RPD) of ≤50% (soil), and <30% (groundwater). RLs and method detection limits (MDL) are provided in Attachment B.

Accuracy

Accuracy is the measurement of the reproducibility of the sampling and analytical methodology. It should be noted that precise data may not be accurate data. For the purpose of this QAPP, bias is defined as the constant or systematic distortion of a measurement process, which manifests itself as a persistent positive or negative deviation from the known or true value. This may be due to (but not limited to) improper sample collection, sample matrix interferences, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

Accuracy in the field is assessed through the use of field blanks and through compliance to all sample handling, preservation, and holding time requirements. All field blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank was evaluated against laboratory blanks (preparation or method)

and evaluated against field samples collected on the same day to determine potential for bias.

Laboratory accuracy is assessed by evaluating the percent recoveries of MS/MSD samples, LCS/LCSDs, surrogate compound recoveries, internal standard responses and the results of method preparation blanks. MS/MSD, LCS/LCSD, internal standard responses and surrogate percent recoveries were compared to either method-specific control limits or laboratory-derived control limits. Sample volume permitting, samples displaying outliers should be reanalyzed. All associated method blanks should be non-detect when analyzed by the laboratory.

Completeness

Laboratory completeness is the ratio of total number of samples analyzed and verified as acceptable compared to the number of samples submitted to the fixed-base laboratory for analysis, expressed as a percent. Three measures of completeness are defined:

- Sampling completeness, defined as the number of valid samples collected relative to the number of samples planned for collection;
- Analytical completeness, defined as the number of valid sample measurements relative to the number of valid samples collected; and
- Overall completeness, defined as the number of valid sample measurements relative to the number of samples planned for collection.

Soil and groundwater data will meet a 90% completeness criterion. If the criterion is not met, sample results will be evaluated for trends in rejected and unusable data. The effect of unusable data required for a determination of compliance will also be evaluated.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is dependent upon the adequate design of the sampling program and was satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. This is performed by following applicable standard operating procedures (SOPs) and this QAPP. All field technicians will

be given copies of appropriate documents prior to sampling events and will be required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is performed by following all applicable EPA and standard methods, laboratory-issued SOPs, the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

Comparability

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and was satisfied by ensuring that the sampling plan is followed and that sampling is performed according to the SOPs or other project-specific procedures. Analytical data were comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability was controlled by requiring the use of specific nationally-recognized analytical methods and requiring consistent method performance criteria. Comparability is also dependent on similar quality assurance objectives. Previously collected data were evaluated to determine whether they may be combined with contemporary data sets.

Sensitivity

Sensitivity is the ability of the instrument or method to detect target analytes at the levels of interest (e.g., at the NYSDEC Subpart 375-6 Soil Cleanup Objectives). The Project Manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection and QC acceptance limits that meet established performance criteria. Concurrently, the Project Manager will select the level of data assessment to ensure that only data meeting the project DQOs are used in decision-making.

Field equipment will be used that can achieve the required levels of detection for analytical measurements in the field. In addition, the field sampling staff will collect and submit full volumes of samples as required by the laboratory for analysis, whenever possible. Full volume aliquots will help ensure achievement of the required limits of detection and allow for reanalysis if necessary. The concentration of the lowest level check standard in a multi-point calibration curve will represent the reporting limit.

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated field blanks and duplicate samples will be based on the recommendations listed in DER-10 and as described in Section 5.3.2.

5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES

Soil sampling will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010). The following sections describe procedures to be followed for specific tasks.

5.1 Field Documentation Procedures

Field documentation procedures will include summarizing field data in field books and proper sample labeling. These procedures are described in the following sections.

5.1.1 Field Data and Notes

Field notebooks contain the documentary evidence regarding procedures conducted by field personnel. Hard cover, bound field notebooks will be used because of their compact size, durability and secure page binding. The pages of the notebook will not be removed.

Entries were made in waterproof, permanent blue or black ink. No erasures will be allowed. Incorrect entries will be crossed out with a single strike mark and the change initialed and dated by the team member making the change.

Each entry will be dated. Entries will be legible and contain accurate and complete documentation of the individual or sampling team's activities or observations made. The level of detail will be sufficient to explain and reconstruct the activity conducted. Each entry will be signed by the person(s) making the entry.

The following types of information will be provided for each sampling task, as appropriate:

- Project name and number;
- Reasons for being on-site or taking the sample;

- Date and time of activity;
- Sample identification numbers;
- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches were made in the field logbook when appropriate;
- Physical location of sampling locations such as depth below ground surface;
- Description of the method of sampling including procedures followed, equipment used and any departure from the specified procedures;
- Description of the sample including physical characteristics, odor, etc.;
- Readings obtained from health and safety equipment;
- Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample;
- Photographic information including a brief description of what was photographed, the date and time, the compass direction of the picture and the number of the picture on the camera;
- Other pertinent observations such as the presence of other persons on the site, actions by others that may affect performance of site tasks, etc.; and,
- Names of sampling personnel and signature of persons making entries.

Field records will also be collected on field data sheets including boring logs, which will be used for geologic and drilling data during soil boring activities. Field data sheets will include the project-specific number and stored in the field project files when not in use. At the completion of the field activities, the field data sheets will be maintained in the central project file.

5.1.2 Sample Labeling

Each sample collected will be assigned a unique identification number and placed in an appropriate sample container. Each sample container will have a sample label affixed to the outside with the date and time of sample collection and project name. In addition, the label will contain the sample identification number, analysis required, and chemical preservatives added, if any. All documentation will be completed in waterproof ink. Sample nomenclature procedures are included in Attachment D.

5.2 Equipment Calibration and Preventative Maintenance

A photoionization detector (PID) will be used during the sampling activities to evaluate work zone action levels and screen soil samples. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the site HSO, and will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the logbook regarding the status of field equipment will include the following information:

- Date and time of calibration
- Type of equipment serviced and identification number (such as serial number)
- Reference standard used for calibration
- Calibration and/or maintenance procedure used
- Other pertinent information

Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to the manufacturer's specifications by qualified personnel. Equipment that cannot be repaired will be replaced.

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment and accessories will be maintained in accordance with the manufacturer's recommendations and specifications and established field

equipment practice. Off-site calibration and maintenance will be performed by qualified personnel. A logbook will be kept to document that established calibration and maintenance procedures have been followed. Documentation will include both scheduled and unscheduled maintenance.

5.3 Sample Collection

5.3.1 Soil Samples

Soil samples will be visually classified and field screened using a PID to assess potential impacts from VOCs and for health and safety monitoring. Soil samples collected for analysis of VOCs will be collected using Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected soil sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

Soil samples analyzed for per- and poly-fluoro alkyl substances (PFAS) will be collected in 250-milliliter (mL) high-density polyethylene (HDPE) containers provided by the laboratory and analyzed by using USEPA Method 1633. The laboratory standard operating procedures (SOP) for the analysis of PFAS is included in Attachment E. Soil samples analyzed for 1,4-dioxane will be collected in an 8-ounce jar provided by the laboratory and analyzed using USEPA Method 8270. The reporting limit for 1,4-dioxane in soil is 0.1 milligram per kilogram (mg/kg).

5.3.1.1 Sample Field Blanks and Duplicates

Use of dedicated sampling equipment is planned; therefore, collection of field blanks is not anticipated. If the use of reusable sampling equipment is required, proper decontamination procedures will be employed (as further described in Section 5.7) and field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative soil

samples. If required, field blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Field blanks will be collected at a rate of one per 20 samples and will be analyzed for the complete list of analytes on the day of sampling. If less than 20 samples are collected during a particular sampling event, one field blank sample will be collected. Equipment blanks will be collected at a rate of one per day when soil samples are analyzed for PFAS. Trip blanks will be collected at a rate of one per day if soil samples are analyzed for VOCs during that day.

Duplicate soil samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. If less than 20 samples are collected during a particular sampling event, one MS/MSD sample will be collected. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes.

5.3.2 Groundwater Samples

Groundwater sampling is not anticipated during remedial excavation activities. In the event that groundwater sampling is required, groundwater samples will be collected into laboratory-supplied containers and will be sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to a NYSDOH ELAP-certified analytical laboratory. Analysis and/or

extraction and digestion of collected groundwater samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected groundwater samples will meet all quality assurance criteria set forth by this QAPP and DER-10.

Groundwater samples analyzed for PFAS will be collected in two 250-mL HDPE containers provided by the laboratory and analyzed using USEPA Method 1633. The reporting limit for PFAS in groundwater is 2 nanograms per liter (ng/L). The laboratory SOP for the analysis of PFAS is included in Attachment E. Groundwater samples also be analyzed for 1,4-dioxane will be collected in a one-liter amber glass jar and analyzed using USEPA Method 8270 SIM. The reporting limit for 1,4-dioxane in groundwater is 0.35 micrograms per liter (ug/L).

5.3.2.1 Sample Field Blanks and Duplicates

Use of dedicated sampling equipment is planned; therefore, collection of field blanks is not anticipated. If the use of reusable sampling equipment is required, proper decontamination procedures will be employed (as further described in Section 5.7) and field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative groundwater samples. If required, field blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Field blanks will be collected at a rate of one per 20 samples and will be analyzed for the complete list of analytes on the day of sampling. If less than 20 samples are collected during a particular sampling event, one field blank sample will be collected. Equipment blanks will be collected at a rate of one per day when groundwater samples are analyzed for PFAS. Trip blanks will be collected at a rate of one per day if groundwater samples are analyzed for VOCs during that day.

Duplicate groundwater samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. If less than 20 samples are collected during a particular sampling event, one MS/MSD sample will be collected. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes.

5.3.3 Soil Vapor Samples

Soil vapor sampling is not anticipated during remedial excavation activities. In the event that soil vapor sapling is required, samples will be collected in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH October 2006). Soil vapor implants will be set at a depth of approximately 14-feet below current site grades which corresponds to the depth interval directly below the proposed development excavation depth. Each vapor probe will consist of a new, dedicated stainless steel screen implant connected to polyethylene or Teflon™ tubing extending to the target depth. About 1 foot of clean sand filter pack will be placed around the screen implant, and the remaining annular space will be backfilled to grade with hydrated bentonite. Sampling will occur for the duration of 2 hours.

Samples will be collected in appropriately sized Summa canisters that have been certified clean by the laboratory and samples will be analyzed by using USEPA Method TO-15. Flow rate for both purging and sampling will not exceed 0.2 L/min. 24-hours following soil vapor probe installation, one to three implant volumes shall be purged prior to the collection of any soil-gas samples. A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of

canisters before and after the samples are collected, apparent moisture content of the sampling zone, and chain of custody protocols.

As part of the vapor intrusion evaluation, a tracer gas will be used in accordance with NYSDOH protocols to serve as a quality assurance/quality control (QA/QC) device to verify the integrity of the soil vapor probe seal. A container (box, plastic pail, etc.) will serve to keep the tracer gas in contact with the probe during testing. A portable monitoring device will be used to analyze a sample of soil vapor for the tracer gas prior to sampling. If the tracer sample results show a significant presence of the tracer, the probe seals will be adjusted to prevent infiltration. At the conclusion of the sampling round, tracer monitoring will be performed a second time to confirm the integrity of the probe seals.

5.3.3.1 Soil Vapor Sample Duplicates

Duplicate soil vapor samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

5.3.4 PFAS Sampling Procedures

Soil sampling for PFAS analysis will be completed during the remedial action. All soil samples collected during the proposed sampling event will be analyzed for PFAS. Field personnel conducting PFAS sampling will wear clothing and use equipment which does not contain PFAS materials including: powderless nitrile gloves, natural rubber overboots, and synthetic and natural fiber clothing. Clothing advertised as waterproof, water-repellant, and/or dirt and/or stain resistant will not be worn. Personal hygiene products with conditioning agents will be avoided prior to the sampling event. Insect repellent and sunscreen will be avoided. Consumption of food and/or beverages will be strictly prohibited during sampling activities, excluding bottled water for hydration. Ballpoint pens will be used as the sole writing instrument to complete labels and record field notes. Waterproof field books, including "Rite-in-Rain"™ will be avoided.

Only sampling equipment known to be devoid of PFAS containing materials will be used. Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. In general, PFAS-free pumps, tubing, interface probes, soil sampling equipment, and bottleware will be considered prior to the sampling event. It is not anticipated that groundwater samples will be collected for PFAS analysis; however, if required, peristaltic pumps will be utilized as the depth of groundwater is less than 20-feet. If groundwater is determined to be greater than 20 feet deep, bladder pumps (QED Sample Pro, or equivalent) with a fluoropolymer-free bladder will be used. HDPE will be used for tubing, soil sampling equipment, and bottleware.

Field personnel will follow standard discrete soil sampling and low flow procedures when sampling for PFAS. When possible, disposable and dedicated equipment will be used for each sample location to avoid potential cross contamination and limit errors from inadequate decontamination between samples. Bladder pumps and/or peristaltic pump tubing will not be re-used and therefore decontamination of sampling equipment between samples will not be necessary. Nitrile gloves will be changed between each step during set up and sampling.

When sampling for PFAS, no sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

Whenever an action occurs outside of procedure, such as the writing of field notes, nitrile gloves will be changed. Sampling equipment will be staged 5-feet away from the boring or open wellhead. Equipment not directly related to sampling will be staged in a separate area away from the boring or open wellhead. When inserting the tubing into the well, the surrounding platform will be avoided as a source of transference. While stabilizing the well, the pump will not be allowed to stop as backflow from the water quality meter can pose a risk to cross contamination. Once stability has been achieved, sampling will occur. PFAS sample bottleware must be made of HDPE and bottleware must be filled to the container neck. Soil sample bottleware must only be filled half-way. The PFAS field and equipment blanks will be collected immediately following

completion of PFAS sampling at the frequency discussed above (Sections 5.3.1.1 and 5.3.2.1).

The PFAS compounds to be analyzed includes: Perfluorobutanesulfonic acid (PFBS), Perfluoropentanesulfonic acid (PFPeS), Perfluorohexanesulfonic acid (PFHxS), Perfluoroheptanesulfonic acid (PFHpS), Perfluorooctanesulfonic acid (PFOS), Perfluorononanesulfonic acid (PFNS), Perfluorodecanesulfonic acid (PFDS), Perfluorododecanesulfonic acid (PFDoS), Perfluorobutanoic acid (PFBA), Perfluoropentanoic acid (PFPeA), Perfluorohexanoic acid (PFHxA), Perfluoroheptanoic acid (PFHpA), Perfluorooctanoic acid (PFOA), Perfluorononanoic acid (PFNA), Perfluorodecanoic acid (PFDA), Perfluoroundecanoic acid (PFUnA), Perfluorododecanoic acid (PFDoA), Perfluorotridecanoic acid (PFTrDA), Perfluorotetradecanoic acid (PFTeDA), Hexafluoropropylene oxide dimer acid (HFPO-DA), 4,8-Dioxa-3H-perfluorononanoic acid (ADONA), Perfluoro-3-methoxypropanoic acid (PFMPA), Perfluoro-4-methoxybutanoic acid (PFMBA), Nonafluoro-3,6-dioxaheptanoic acid (NFDHA), 4:2 Fluorotelomer sulfonic acid (4:2-FTS), 6:2 Fluorotelomer sulfonic acid (6:2-FTS), 8:2 Fluorotelomer sulfonic acid (8:2-FTS), 3:3 Fluorotelomer carboxylic acid (3:3 FTCA), 5:3 Fluorotelomer carboxylic acid (5:3 FTCA), 7:3 Fluorotelomer carboxylic acid (7:3 FTCA), Perfluorooctane sulfonamide (PFOSA), N methylperfluorooctane sulfonamide (NMeFOSA), N-ethylperfluorooctane sulfonamide (NEtFOSA), N-methylperfluorooctane sulfonamidoacetic acid (N-MeFOSAA), N ethylperfluorooctane sulfonamidoacetic acid (N EtFOSAA), N methylperfluorooctane sulfonamidoethanol (NMeFOSE), N ethylperfluorooctane sulfonamidoethanol (NEtFOSE), 9 Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major) (9Cl PF3ONS), 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor) (11Cl-PF3OUdS), Perfluoro(2-ethoxyethane) sulfonic acid (PFEESA).

5.4 Sample Containers and Handling

Certified, commercially clean sample containers will be obtained from the analytical laboratory. The laboratory will also prepare and supply the required field blank sample containers and reagent preservatives. Sample containers, including the field blank containers, will be placed in plastic coolers by the laboratory. These coolers will be received by the field sampling team within

24 hours of their preparation in the laboratory. Prior to the commencement of field work, Langan field personnel will fill the plastic coolers with regular ice only in Ziploc® bags (or equivalent) to maintain a temperature of 4°C±2° C.

Samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. Samples will then be placed and stored on-ice in laboratory provided coolers until shipment to the laboratory. The temperature in the coolers containing samples and associated field blanks will be maintained at a temperature of 4°C±2°C while on-site and during sample shipment to the analytical laboratory.

Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by the analytical laboratory or are properly disposed. Chain-of-custody procedures, described in Section 5.9, will be followed to maintain and document sample possession. Samples will be packaged and shipped as described in Section 5.6.

5.5 Sample Preservation

Sample preservation measures will be used in an attempt to prevent sample decomposition by contamination, degradation, biological transformation, chemical interactions and other factors during the time between sample collection and analysis. Preservation will commence at the time of sample collection and will continue until analyses are performed. Should chemical preservation be required, the analytical laboratory will add the preservatives to the appropriate sample containers before shipment to the office or field. Samples will be preserved according to the requirements of the specific analytical method selected, as shown in Attachment C.

5.6 Sample Shipment

5.6.1 Packaging

Sample containers will be placed in plastic coolers. Regular ice only in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will be placed in a Ziploc® bag (or equivalent) and placed inside the cooler and custody seals will be affixed to one side of the cooler at a minimum. If the samples are being shipped by an express delivery company (third-party

courier, e.g., FedEx) then laboratory address labels will be placed on top of the cooler.

5.6.2 Shipping

Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below.

- All environmental samples will be transported to the laboratory from the site or Langan office by a laboratory provided courier under the chain-of-custody protocols described in Section 5.9. A third-party courier may be used if necessary.
- Prior notice will be provided to the laboratory regarding when to expect shipped samples. If the number, type or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

5.7 Decontamination Procedures

Though not anticipated, decontamination procedures will be used if non-dedicated sampling equipment is utilized during the RAWP. Field sampling equipment that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and tap water scrub to remove visual contamination
2. Generous tap water rinse
3. Distilled/de-ionized water rinse

Field sampling equipment that will be used for the collection of PFAS samples that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and clean, PFAS-free water scrub to remove visual contamination
2. Generous clean, PFAS-free water rinse

5.8 Residuals Management

Debris (e.g., paper, plastic, and disposable PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal.

5.9 Chain of Custody Procedures

A chain-of-custody protocol has been established for collected samples was and will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping, storage and analysis to data reporting and disposal. Chain-of-custody refers to actual possession of the samples. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except for third-party shipping couriers, is responsible for sample integrity and safe keeping. Chain-of-custody procedures are provided below:

- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.
- Following sample collection, the chain-of-custody form will be completed for the samples collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., preservatives) will be recorded on the form. Entries will be made in waterproof, permanent blue or black ink.
- Langan field personnel will be responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The sampling/Field Team Leader will be responsible for enforcing chain-of-custody procedures during field work.
- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling/Field Team Leader will check the form for possible errors and sign the chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed.

Samples will be packaged for shipment or pickup via courier to the laboratory with the appropriate chain-of-custody form. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form. A copy of the form will be retained by the Langan sampling team for the project file, and the original will be sent to the laboratory with the samples. Bills of lading will also be retained as part of the documentation for the chain-of-custody records, if applicable. When transferring custody of the samples, the individuals relinquishing and receiving custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the chain-of-custody form. This process documents sample custody transfer from the sampler to the analytical laboratory.

Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory's Quality Assurance Manual. The analytical laboratory will provide a copy of the chain-of-custody in the analytical data deliverable package. The chain-of-custody becomes the permanent record of sample handling and shipment.

5.10 Laboratory Sample Storage Procedures

The subcontracted laboratory will use a laboratory information management system (LIMS) to track and schedule samples upon receipt by the analytical laboratories. Any sample anomalies identified during sample log-in must be evaluated on individual merit for the impact upon the results and the data quality objectives of the project. When irregularities do exist, Langan must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

For samples requiring thermal preservation, the temperature of each cooler will be immediately recorded. Each sample and container will be assigned a unique laboratory identification number and secured within the custody room walk-in coolers designated for new samples. Samples will be, as soon as practical, disbursed in a manner that is functional for the operational team. The temperature of all coolers and freezers will be monitored and recorded using a certified temperature sensor. Any temperature excursions outside of acceptance criteria (i.e., below 2°C or above 6°C) will initiate an investigation to determine whether any samples may have been affected. Following analysis,

the laboratory's specific procedures for retention and disposal will be followed as specified in the laboratory's SOPs and/or QA manual.

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 Introduction

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 appropriate for the analyses to be performed and be reported in standard format.

The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

6.2 Data Reduction

The Analytical Services Protocol (ASP) Category B data packages and an electronic data deliverable (EDD) will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition.

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQuIS. To avoid transcription errors, data will be loaded directly into the American Standard Code for Information Interchange (ASCII) format from the LIMS. If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been

completed, the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

6.3 Data Validation

Data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of the QC sample results,
- Verification of the identification of sample results (both positive hits and non-detects),
- Recalculation of 10 percent of all investigative sample results, and
- Preparation of Data Usability Summary Reports (DUSR).

A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;

- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- Inductively couple plasma (ICP) serial dilutions; and
- Results verification and reported detection limits.

Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- "UJ" - Not detected. Quantitation limit may be inaccurate or imprecise;
- "J" - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method;
- "N" – Tentative identification. Analyte is considered present in the sample;
- "R" – Unreliable result; data is rejected or unusable. Analyte may or may not be present in the sample; and,
- No Flag - Result accepted without qualification.

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

7.1 Introduction

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

7.2 System Audits

System audits may be performed by the QAO or designated auditors and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

7.3 Performance Audits

The laboratory may be required to conduct an analysis of Performance Evaluation samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

7.4 Formal Audits

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria.

Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management. Non-compliances will be logged, and documented through audit findings, which are attached to and are a part of the integral audit report. These audit-finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

8.0 CORRECTIVE ACTION

8.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

8.2 Procedure Description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined, and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and,
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 8.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status

of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

FIGURE 8.1

CORRECTIVE ACTION REQUEST Number: _____ Date: _____
TO: _____ You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____
CONDITION:
REFERENCE DOCUMENTS:
RECOMMENDED CORRECTIVE ACTIONS:
_____ _____ _____ _____ _____ _____ Originator Date Approval Date Approval Date
RESPONSE
CAUSE OF CONDITION
CORRECTIVE ACTION (A) RESOLUTION (B) PREVENTION (C) AFFECTED DOCUMENTS
C.A. FOLLOWUP: CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

9.0 REFERENCES

NYSDEC. Division of Environmental Remediation. DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.

NYSDEC. Division of Environmental Remediation. Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs, dated April 2023.

NYSDOH. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan

USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. U.S. Environmental Protection Agency, Washington, D.C.

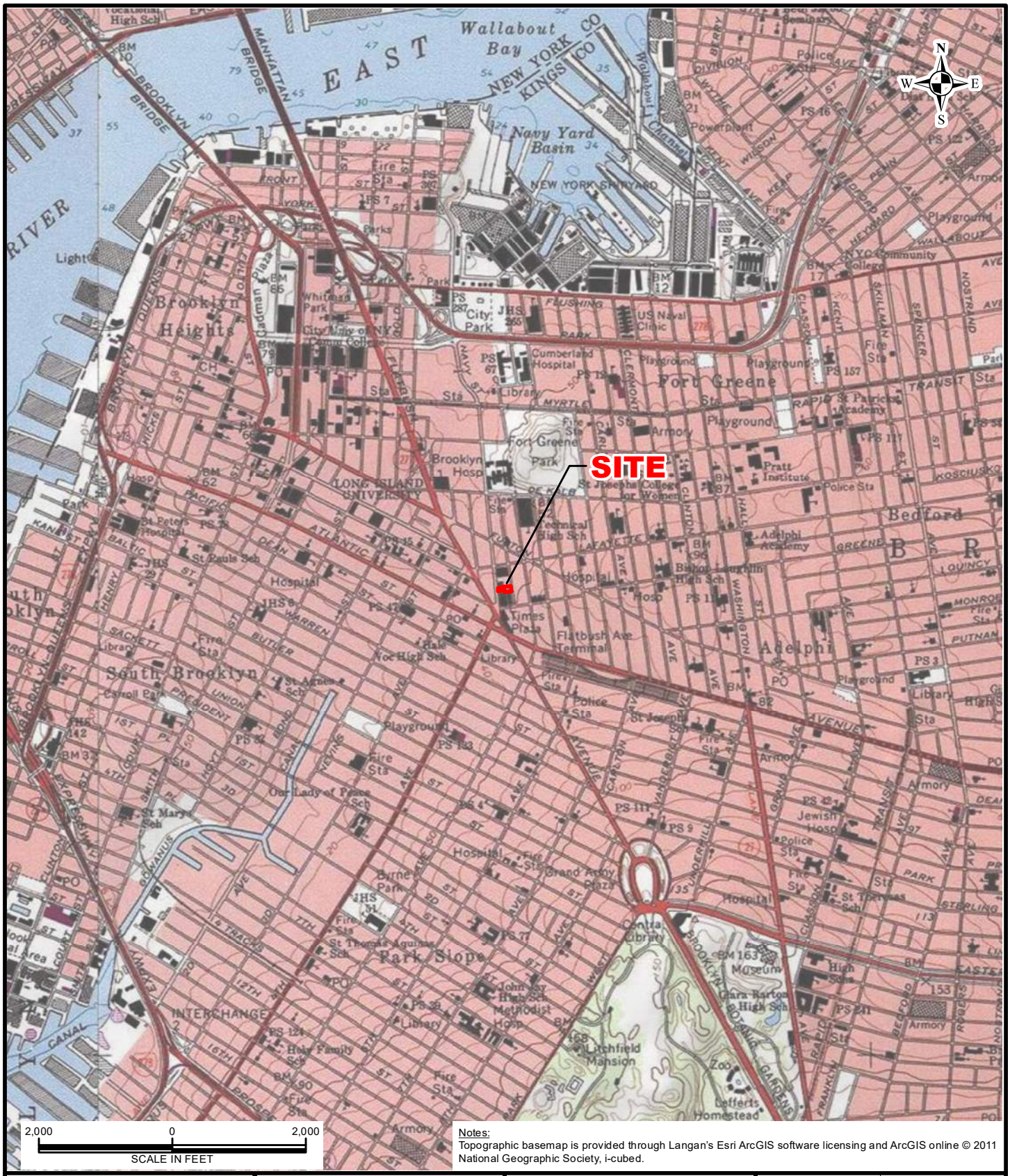
USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7 - U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No. HW-6, Revision #8, dated January 1992. USEPA Region II.

USEPA, 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90. SOP No. HW-2, Revision XI, dated January 1992. USEPA Region II.

USEPA. Hazardous Waste Support Section. Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15. SOP No. HW-31, Revision #6, dated June 2014.

FIGURES



Notes:
Topographic basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online © 2011 National Geographic Society, i-cubed.

LANGAN
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Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
130 SAINT FELIX STREET
BLOCK No. 2111, LOT No. 40
BROOKLYN NEW YORK

Drawing Title
SITE LOCATION MAP

Project No.	100842301
Date	7/30/2020
Scale	1"=2,000'
Drawn By	ATR
Figure	1

© 2013 Langan

Path: \\langan.com\data\PAR\data3\100842301\Project Data\ArcGIS\MXD\Environmental_Figures\2020-07 - RIWP\Figure 1 - Site Location Map.mxd Date: 7/30/2020 User: aruane Time: 1:07:04 PM

20 0 20
SCALE IN FEET

Notes:
1. Aerial imagery provided through Langan's subscription to Nearmap, dated 19 July 2022.
2. Parcel information from MapPLUTO 18v2 copyrighted by the New York City Department of Planning.
5. Site boundary extents are based on Metes and Bounds Description provided by True North Surveyors, P.C.
4. Elevation data based on the "Support of Excavation General Plan" SOE 101.00 prepared by FX Collaborative Architects LLC as dated 22 April 2022 and submitted 22 July 2022.

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Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
130 SAINT FELIX STREET
BLOCK No. 2111, Portion of LOT No. 40
BROOKLYN NEW YORK

Drawing Title
PROPOSED ENDPOINT CONFIRMATION/ DOCUMENTATION SAMPLING

Project No. 100842301
Date 5/31/2024
Scale 1" = 20 feet
Drawn By PDT
Figure 2

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Path: \\langan.com\data\PAR\data3\100842301\Project Data\ArcGIS\APRX\100842301\100842301.aprx Date: 5/31/2024 User: lkott Time: 9:01 AM

ATTACHMENT A

Resumes

RONALD D. BOYER, PE

PRINCIPAL/VICE PRESIDENT

GEOTECHNICAL ENGINEERING

Mr. Boyer is an experienced geotechnical engineer whose practice involves coordination and supervision of subsurface investigations; establishment and monitoring of geotechnical instrumentation; design of shallow and deep foundation systems; evaluation of earth slope stability; design and inspection of subgrade improvement applications; preparation of geotechnical engineering reports and construction specifications; performance of pre-construction conditions documentation; coordination and supervision of construction inspection services; and monitoring of adjacent structures during demolition and construction.

SELECTED PROJECTS

- 11 Hubert Street, New York, NY
- 110 University Place, New York, NY
- 111 Murray Street Development, New York, NY
- 120 Neptune Avenue, Brooklyn, NY
- 125 Greenwich Street Development, New York, NY
- 150 Amsterdam Avenue, New York, NY
- 22 Thames Street, New York, NY
- 225 East 39th Street Development, New York, NY
- 2329 Nostrand Avenue, Brooklyn, NY
- 259 West 10th Street, New York, NY
- 315 East 46th Street, New York, NY
- 414 West 15thh Street, New York, NY
- 485 Fifth Avenue, New York, NY
- 510 West 22nd Street, New York, NY
- 57 Reade Street Development, New York, NY
- 92 Fulton Street, New York, NY
- American Dream Meadowlands, East Rutherford, NJ
- Avalon Bay, Boonton, NJ
- Bank Street Commons, White Plains, NY
- Brooklyn Law School Dormitory, Brooklyn, NY
- Cape Liberty Cruise Port, Bayonne, NJ
- CarMax - Waterbury, CT
- Christian Cultural Center, Brooklyn, NY
- Christiana Phase 2 Retail Development, Christiana, DE
- Circuit City Store, Wayne, NJ
- Clifton Commons, Clifton, NJ
- Colgate-Palmolive Waterfront Development, Various Locations
- Daily News Printing Press Facility, Jersey City, NJ
- DDC Rikers Island, New York, NY
- Essex Street Roadway Improvements, Hackensack, NJ
- Fifth Avenue Presbyterian Church, New York, NY
- General Motors - Lighthouse Landing, Sleepy Hollow, NY
- Giants Training Facility, East Rutherford, NJ
- Golden Orchards Geotechnical Support, Washington Township, NJ

EDUCATION

M.S., Civil Engineering (Geotechnical) Virginia Tech

B.S., Civil Engineering Virginia Tech

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ, NY

AFFILIATIONS

Deep Foundations Institute (DFI)

American Institute of Architects

Associated General Contractors of NJ

- Greenwich School, Greenwich, NJ
- Hudson County Courthouse, Jersey City, NJ
- K. Hovnanian at Bedminster Stormwater Detention System, Bedminster, NJ
- Kinko's, Norwalk, CT
- Kohl's Distribution Center, Mamakating, NY
- Lehman Brothers Data Center, Cranford, NJ
- Lehman Brothers Data Center, Piscataway, NJ
- Lowe's Norwalk, CT
- MetLife Stadium, East Rutherford, NJ
- Metropolitan Executive Towers, East Rutherford, NJ
- Morgan Stanley Data Center, Somerset, NJ
- Morristown Airport Hanger, Morristown, NJ
- MOMA West, New York, NY
- Newark International Airport, CONRac, Newark, NJ
- Newark International Airport, AirTrain Replacement, Newark, NJ
- New Britain Retail Center, New Britain, CT
- Northwest Airlines Cargo Facility, JFK International Airport, Queens, NY
- Norwalk Retail Development, Norwalk, CT
- One Bridge Plaza, Fort Lee, NJ
- PRBC - Medical Office Building, East Stroudsburg, PA
- Prospect Plaza, Brooklyn, NY
- PSEG Overhead Transmission, Throughout NJ
- River Bend at Port Imperial, West New York, NJ
- River Street Redevelopment, Hackensack, NJ
- Riverfront Stadium Redevelopment, Newark, NJ
- Riverside Square Mall Expansion, Hackensack, NJ
- Roosevelt Island DEP Seawall, New York, NY
- Roosevelt Island Park, Esplanade and Seawall, New York, NY
- Route 209 Expansion, Mamakating, NY
- Route 3 Flyover Bridge, Meadowlands, East Rutherford, NJ
- St Barnabas Hospital, Livingston, NJ
- Stevens Institute of Technology, Student Housing and University Center, Hoboken, NJ
- Stop & Shop, Various Locations
- T172 & S171N Transmission Lines, North Smithfield, RI
- Target Development, Bethel, CT
- Target Store, Horn Lake, MS
- Temporary Office Trailer Complex, East Rutherford, NJ
- The Standard, New York, NY
- The Venetian, Brooklyn, NY
- Westlakes Office Complex, Berwyn, PA
- Yonkers Avenue Bridge, Westchester County, NY

JOSEPH CONBOY

STAFF CHEMIST

ENVIRONMNETAL

Mr. Conboy has seven years of environmental chemistry, quality assurance, and environmental database management experience, with a current emphasis on validation of laboratory data for submittal to NJDEP via the New Jersey Data of Known Quality Protocols and to NYSDEC. Previous work experience includes performing validation of data for projects in USEPA Regions 2 and 3 while employing appropriate validation guidelines for each region, managing large data sets, updating appropriate regulatory limits, performing statistical evaluations, and preparing electronic data deliverables and report deliverables using the Earthsoft EQuIS database program, and acted as an intermediary between project managers, field staff, and laboratories. Mr. Conboy also has experience in field sampling techniques and maintains current OSHA HAZWOPER certification.

SELECTED PROJECTS

- 1400 Ferris, Bronx, NY – Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs and SVOCs including 1,4-dioxane, and tangentially used based on professional judgment to perform validation of PFAS data.
- Broome Street Parking Lot, NY - Completed validation of waste characterization data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs, SVOCs, herbicides, PCBs, pesticides, metals including mercury, ignitability temperature, pH, reactive cyanide, reactive sulfide, cyanide, and hexavalent chromium. Toxicity characteristic leachate procedure extraction data for VOCs, SVOCs, herbicides, pesticides, metals, and mercury were also validated.
- 215 North 10th Street, Brooklyn, NY - Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data.
- 35 Commercial Street, Brooklyn, NY - Completed validation of soil data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.
- Suffolk Street, Lower East Side, NY- Completed validation of soil, groundwater, and soil vapor data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II

EDUCATION

B.Sc., Chemistry with a minor in Mathematics
Rowan University

CERTIFICATIONS & TRAINING

OSHA 40-Hour HAZWOPER 29 CFR 1910.120(e)(4) Certification

NJ Analytical Guidance and Data Usability Training

USEPA Data Validation Training

Earthsoft EQuIS Environmental Database Training

guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, VOCs by USEPA TO-15, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.

- Managed a database for a confidential client containing 10+ years of environmental chemical data from multiple laboratories, requiring select data validation in accordance with New Jersey Data of Known Quality Protocols and identifying areas of delineation from historic field information. Once identified, NJDEP designated groundwater, surface water, soil, sediment, soil vapor, and custom screening criteria were researched and applied to each area, requiring individualized flagging for reporting.*
- Prepared the New Jersey Data of Known Quality Protocol Data Usability Evaluation and managed the database for a confidential client for a data set greater than 20 years old. A DUE or any validation effort was not prepared in the 20 years prior to current. This included data from variations of methods for volatile organic compounds, semivolatile organic compounds, total and dissolved metals, pesticides, herbicides, natural attenuation parameters, and per- and polyfluoroalkyl substances in multiple media.*
- Performed 200+ Stage 2a validations for a combined 87-acre USEPA designated Corrective Action site under the Resource Conservation and Recovery Act, including a quick-turn USEPA required PCB by soxhlet extraction investigation across multiple plants. Once a former train car painting facility, USEPA required a quick-turn PCB by soxhlet extraction soil investigation.
- Preparation of a quality assurance program for a confidential client in West Virginia. A quick turn QAPP was prepared in a service location new to the consultant, resulting in research into state requirements for data usability and auditing newly employed laboratories. The QAPP was understood to be prepared for groundwater only, but the client did not reveal the need for sediment and soil. Two QAPPs were submitted for review to governing agencies.*
- Used statistical software to determine a localized background upper confidence limit of chromium for a confidential client's sand and gravel site. Validation was used to confirm laboratory procedures, and data was used in ProUCL calculations to compare to researched background chromium levels for Pennsylvania soils. *
- Prepared daily perimeter dust and air monitoring summaries and validation of low level mirex data for a confidential client's superfund site. Low level mirex data was generated by university laboratories and subject to validation following national functional guidelines to aide in river clean-up, including sediment, surface water, and treatment system water matrices.*

**Project completed prior to employment at LANGAN.*

MARLENA JEWETT

DATA ANALYST

CAD/GIS

1 year in the industry

Proposed Title: Field Technician

Ms. Jewett is a data analyst with experience in database design, management and visualization using EarthSoft's EQuIS™ database in support of environmental site characterizations for sites regulated under federal and state compliance programs. Her expertise includes integration of analytical databases and coordination with GIS users.

In her current role Marlena assists project teams with planning and implementation of project databases and data visualization. This includes coordinating with field staff and laboratories to define, workflows, SOPs and ensure the receipt of the proper deliverables for field and lab data; reviewing and managing project data and information using EQuIS™, Microsoft® Access, and Excel; generating data reports including tables, graphs, charts, and GIS compatible files; and generating and reviewing electronic data deliverables following project or agency specific formats.

Education

B.A., Environmental Economics
Colgate University

Work History

Equitable Advisors
Financial Advisor
9/7/2020-4/23/2021

Langan
Data Analyst
5/10/2021 – Present

SELECTED PROJECTS

EQuIS Management and NYSDEC deliverables – Data Analyst. Loaded and maintained soil, groundwater, and soil vapor data in an EQuIS database for a remedial investigation and waste characterizations of New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), NYC Office of Environmental Remediation (OER), and due diligence sites. Provided final report deliverables including sample summaries; tags; and exceedance summary exports from EQuIS. Completed this work for the following projects:

- **2-8 Main Street**
- **28-90 Review Avenue**
- **34-15 10th Street**
- **37-11 30th Street**
- **44-01 Northern Boulevard**
- **45 Commercial Avenue**
- **50 Jersey Avenue**
- **111 Willow Street**
- **118 West 13th Street**
- **122 Fifth Avenue**
- **155 Third Street**
- **160 East 125th Street**
- **210 Clarkson Avenue**
- **241 West 28th Street**
- **266 West 96th Street**
- **445 Gerard Avenue**
- **475 Bay Street and 31 Wave Street**

MARLENA JEWETT– FIELD TECHNICIAN

- **495 Peninsula Boulevard**
- **561 Greenwich Street**
- **563 Sackett Street**
- **805-825 Atlantic Avenue**
- **1525 Bedford Avenue**
- **2455 Third Avenue**
- **4650 Broadway**
- **ABC Block 27**
- **Bay Crane**
- **Broome Street**
- **Former Grant Hardware**
- **Forsyth and Delancy Street**
- **Gowanus Canal Northside**
- **Greenpoint Landing E1**
- **Greenpoint Landing Parcel H3**
- **John Evans**
- **Kissena Boulevard**
- **NYCHA Farragut**
- **Remeeder**

LAUREN KOTT, PE

SENIOR STAFF ENGINEER

ENVIRONMENTAL ENGINEERING, REMEDIAL INVESTIGATION

Ms. Kott has 9 years of experience working on environmental projects, particularly investigation and remediation of environmental contamination. She has participated in multiple phases of site remediation including site investigation, remedial investigation, and remedial action. Her experience includes sample collection and characterization of various environmental media, and preparing reports and other environmental regulatory documents.

SELECTED PROJECTS

- Passaic Gifted and Talented Academy School No 20, Passaic, NJ*
- Former GM Plant and Redevelopment, Ewing, NJ*
- The Chelsea at Greenburgh, White Plains, NY*
- Brightview Devon, Wayne, PA*
- Residential Property, New Paltz, NY*
- Former Industrial Property, Bayonne, NJ*
- Childcare Facility, Jersey City, NJ*
- Allied Concrete, Rockaway, NJ*
- Mountain Creek, Vernon, NJ*
- Frankford Firehouse, Branchville, NJ*
- Venue at Longview, Plumsted Township, NJ*
- Venue at Smithville Greene, Eastampton, NJ*
- The Collection at Morristown, Morris Plains, NJ*
- Gables at Woodcliff Lake, Woodcliff Lake, NJ*
- Mountain Ridge Development, Mt. Olive, NJ*
- Brightview Port Jefferson, Port Jefferson, NY*
- Brightview Paramus, Paramus, NJ*
- Proposed Senior Living Facility, Rockville Centre, NY*

EDUCATION

B.E., Environmental Engineering
University of Delaware

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ

10-Hour Construction Safety

40-Hour HAZWOPER

** Denotes experience with previous firm*

Christopher McMahon, CHMM

Associate

Brownfield Redevelopment, Environmental Site Assessments, Site Investigation/Remedial Actions, Vapor Intrusion Investigations

15 years in the industry ~ 9 years with Langan

Mr. McMahon is a consulting geologist whose primary focus within his tenure at Langan has been in providing environmental support to redevelopment sites within the metropolitan New York area. He has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup, Voluntary Cleanup and Spill Programs, and New York City Office of Environmental Remediation E-Designated and New York City Voluntary Cleanup Program sites. These projects have included the completion of Phase I environmental site assessments, Phase II and remedial investigations, UST closures, NYSDEC closures and remedial excavation oversight for off-site disposal and/or treatment. Mr. McMahon also has significant field experience including implementation and management of all phases of environmental projects involving soil, sediment, groundwater, surface water, and soil vapor contamination including Phase I inspections, Phase II site investigations, Remedial Investigations, and Remedial Actions.

Many of these projects have included his oversight of remedial actions to clean up or mitigate hazardous waste sites in rural, urban, and industrial settings. These remedial action designs have included in-situ soil remedial injections, contaminated soil removal/disposal management plans, and soil vapor intrusion mitigation systems including advanced vapor barriers and sub-slab depressurization systems.

Selected Projects

NYSDEC Brownfield Redevelopment 363 and 365 Bond Street, Brooklyn, NY
NYSDEC Brownfield Redevelopment, Fashion Outlets of Niagara Falls, NY
NYSDEC Spills Redevelopment, 540 West 26th Street, New York, NY
NYSDEC Spills Redevelopment, 101 Murray Street, New York, NY
NYSDEC Spills Redevelopment, 110 University Place, New York, NY
NYSDEC Spills Redevelopment, Grant Park, Yonkers, NY
NYSDEC Spills Redevelopment, The Shops At Nanuet, Nanuet, NY
NYCOER E-Designation Remediation, 505 W 19th Street, New York, NY
NYCOER E-Designation Remediation, 53 West 53rd Street, New York, NY
NYCOER E-Designation Remediation, 525 West 52nd Street, New York, NY
NYCOER E-Designation Remediation, 412 Greenwich Street, New York, NY
NYCOER E-Designation Remediation, 508 West 24th Street, New York, NY
NYSDEC (Region 7) Site Remedial Investigation, Hillcrest, NY
Former Manufactured Gas Plant Site Remedial Investigation, Geneva, NY
NYSDEC (Region 2) Superfund Site Remedial Investigation, Jamaica, NY
NYSDEC (Region 5) Superfund Site Remedial Investigation, Whitehall, NY
Former Manufactured Gas Plant Site Investigation/Confidential Client, Mechanicville, NY
Remedial Investigation of Industrial Facility/Confidential Client, Batavia, NY
OGS Geotechnical Survey for Construction, Rome, NY

Education

B. A., Geology, State University of New York College at Potsdam
With Honors in Geology and Environmental Science

Professional Registration

Certified Hazardous Materials Manager (CHMM)

OSHA 29 CFR 1910.120 Certification for Hazardous Waste Operations and Emergency Response

OSHA Certification for Hazardous Waste Site Supervisor

Red Cross CPR & First Aid Training

LANGAN

Steven Ciambruschini, PG, LEP

Principal/Vice President

Environmental Site Assessments/Investigations, Brownfield Remediation, UST Management

33 years in the industry ~ 28 years with Langan

Mr. Ciambruschini has over 30 years of experience in hydrogeologic and environmental investigations including management of environmental and geotechnical investigations relating to petroleum and chlorinated solvent spill sites, underground storage tank sites, manufactured gas plant sites, landfills, wastewater treatment facilities and industrial/commercial sites. His experience includes managing environmental compliance audits, remedial investigation, pre-acquisition due diligence and permitting assessment, feasibility studies and design, construction and operation of complex innovative remediation systems to treat, contain and recover contaminated soil and groundwater. These projects are managed under various NJDEP, PADEP, NYDEC, NYCDEP and CTDEP programs. Mr. Ciambruschini provides consultation to a diverse group of clients including private developers, utilities, retail and industrial facilities and is expert in assessing remediation options and funding options under various state and federal grant, loan and tax reimbursement programs including Brownfield programs.

Selected Projects

- Brodson Property, Montville NJ, (RCRA, NJDEP ACO Cleanup)
- Carroll Gardens, Brooklyn, NY (NY Brownfield, EPA Superfund, OER E-designated Site)
- Con Edison Appendix B Spill Sites - Various Locations, NY
- Former MGP Site, Brooklyn, NY (VCP Site)
- Extell Development, Hudson Yards, New York, NY (NYC E-designated, NYS Brownfield Site)
- Pan Graphics, Bergen County, NJ (ISRA, LSRP)
- New Jersey Turnpike General Environmental Services Contract, Various Sites, NJ
- Liberty Science Center, Jersey City, NJ (EO 215)
- Blue Back Square, West Hartford, CT (UST, Transfer Act, Brownfield)
- Hershey, Act II Investigation (PA VCP)
- Hershey, Naugatuck, CT (CT Transfer Act)
- Halby Chemical Sites, Various Sites, DE (CERCLA)
- Unisys, Middletown CT, (CT Transfer Act, Brownfield)
- Ryder Rental, Various Sites in CT (CT Transfer Act)
- St. Marks Avenue, Brooklyn, NY (Vapor Mitigation)
- Pan Graphics, Lodi, NJ (Eco Risk Assessment, LSRP)

Education

M.S., Geology
Montclair State University

M.A., Environmental Science
Montclair University

B.S., Environmental Science
Cook College, Rutgers University

Professional Registration

Professional Geologist (PG) in NY, DE, KY

Licensed Environmental Professional (LEP) in CT

Underground Storage Tank License in NJ

Affiliations

National Ground Water Association

Association of Ground Water Scientists and Engineers

American Association of Petroleum Geologists

Environmental Professionals of Connecticut

American Bar Association (ABA)

LANGAN

JESSICA FRISCIA, PE

PROJECT ENGINEER

ENVIRONMENTAL ENGINEERING

Ms. Friscia's experience includes field work and office work on environmental investigation and remediation projects across New Jersey and New York. Her field work experience includes soil, soil vapor, and groundwater sampling; drilling oversight; air monitoring; soil management; and remediation oversight, including excavation, zero-valent iron injections, air sparge/SVE system installation, MPE system installation, and SSDS installation. Her office work experience includes EQuIS database management, data evaluation, remedial design, and report work, including, but not limited to, Phase I ESAs, Preliminary Assessment/Site Investigations, Remedial Investigation Reports, Remedial Action Work Plans, and Remedial Action Reports.

SELECTED PROJECTS

- Former Penick Corporation Facility RCRA Site, Montville, NJ
- Bond Street Brownfields Redevelopment Site, Brooklyn, NY
- CPS/Madison Industries Superfund Site, Old Bridge, NJ
- Rossville Avenue Brownfields Site, Staten Island, NY
- Surf Avenue Brownfields Site, Brooklyn, NY
- St. Felix Street Brownfields Site, Brooklyn, NY
- 42-50 24th Street E-Designated / VCP Site, Long Island City, NY
- 1538 Stillwell Avenue E-Designated / VCP Site, Bronx, NY
- 1905 Surf Avenue E-Designated Site, Brooklyn, NY
- Shrewsbury Avenue LSRP Site, Tinton Falls, NJ
- Church Road LSRP Site, Cherry Hill, NJ
- Former Pan Graphics Facility, Garfield, NJ
- Former Flintkote Company Facility Site, East Rutherford, NJ
- Former Agricultural Research Facility, West Windsor, NJ
- Liberty Plaza VCP Site, Randallstown, MD
- Consolidated Edison Site, New York, NY
- Kent Avenue Site, Brooklyn, NY
- 505 West 19th Street NYCOER E-Designated Site, New York, NY
- 401 Washington Street NYCOER E-Designated Site, New York, NY
- 400 Park Avenue South Site NYCOER E-Designated Site, New York, NY
- Phase I Environmental Site Assessments and Due Diligence Investigations, Various Sites, NY/NJ

EDUCATION

M.E., Environmental and Water Quality Engineering
Massachusetts Institute of Technology

B.E., Civil Engineering
The Cooper Union for the Advancement of Science and Art

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

OSHA 40-Hour HAZWOPER 29 CFR 1910.120(e)(4) Certification

AFFILIATIONS

Beverly Willis Architecture Foundation Emerging Leaders Program

CREW

ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits

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Langan Engineering & Environmental

TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Methylene chloride	75-09-2	5	2.29	ug/kg	70-130	30	70-130	30	30			
1,1-Dichloroethane	75-34-3	1	0.145	ug/kg	70-130	30	70-130	30	30			
Chloroform	67-66-3	1.5	0.14	ug/kg	70-130	30	70-130	30	30			
Carbon tetrachloride	56-23-5	1	0.23	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloropropane	78-87-5	1	0.125	ug/kg	70-130	30	70-130	30	30			
Dibromochloromethane	124-48-1	1	0.14	ug/kg	70-130	30	70-130	30	30			
1,1,2-Trichloroethane	79-00-5	1	0.267	ug/kg	70-130	30	70-130	30	30			
Tetrachloroethene	127-18-4	0.5	0.196	ug/kg	70-130	30	70-130	30	30			
Chlorobenzene	108-90-7	0.5	0.127	ug/kg	70-130	30	70-130	30	30			
Trichlorofluoromethane	75-69-4	4	0.695	ug/kg	70-139	30	70-139	30	30			
1,2-Dichloroethane	107-06-2	1	0.257	ug/kg	70-130	30	70-130	30	30			
1,1,1-Trichloroethane	71-55-6	0.5	0.167	ug/kg	70-130	30	70-130	30	30			
Bromodichloromethane	75-27-4	0.5	0.109	ug/kg	70-130	30	70-130	30	30			
trans-1,3-Dichloropropene	10061-02-6	1	0.273	ug/kg	70-130	30	70-130	30	30			
cis-1,3-Dichloropropene	10061-01-5	0.5	0.158	ug/kg	70-130	30	70-130	30	30			
1,3-Dichloropropene, Total	542-75-6	0.5	0.158	ug/kg				30	30			
1,1-Dichloropropene	563-58-6	0.5	0.159	ug/kg	70-130	30	70-130	30	30			
Bromoform	75-25-2	4	0.246	ug/kg	70-130	30	70-130	30	30			
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.166	ug/kg	70-130	30	70-130	30	30			
Benzene	71-43-2	0.5	0.166	ug/kg	70-130	30	70-130	30	30			
Toluene	108-88-3	1	0.543	ug/kg	70-130	30	70-130	30	30			
Ethylbenzene	100-41-4	1	0.141	ug/kg	70-130	30	70-130	30	30			
Chloromethane	74-87-3	4	0.932	ug/kg	52-130	30	52-130	30	30			
Bromomethane	74-83-9	2	0.581	ug/kg	57-147	30	57-147	30	30			
Vinyl chloride	75-01-4	1	0.335	ug/kg	67-130	30	67-130	30	30			
Chloroethane	75-00-3	2	0.452	ug/kg	50-151	30	50-151	30	30			
1,1-Dichloroethene	75-35-4	1	0.238	ug/kg	65-135	30	65-135	30	30			
trans-1,2-Dichloroethene	156-60-5	1.5	0.137	ug/kg	70-130	30	70-130	30	30			
Trichloroethene	79-01-6	0.5	0.137	ug/kg	70-130	30	70-130	30	30			
1,2-Dichlorobenzene	95-50-1	2	0.144	ug/kg	70-130	30	70-130	30	30			
1,3-Dichlorobenzene	541-73-1	2	0.148	ug/kg	70-130	30	70-130	30	30			
1,4-Dichlorobenzene	106-46-7	2	0.171	ug/kg	70-130	30	70-130	30	30			
Methyl tert butyl ether	1634-04-4	2	0.201	ug/kg	66-130	30	66-130	30	30			
p/m-Xylene	179601-23-1	2	0.56	ug/kg	70-130	30	70-130	30	30			
o-Xylene	95-47-6	1	0.291	ug/kg	70-130	30	70-130	30	30			
Xylene (Total)	1330-20-7	1	0.291	ug/kg				30	30			
cis-1,2-Dichloroethene	156-59-2	1	0.175	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloroethene (total)	540-59-0	1	0.137	ug/kg				30	30			
Dibromomethane	74-95-3	2	0.238	ug/kg	70-130	30	70-130	30	30			
Styrene	100-42-5	1	0.196	ug/kg	70-130	30	70-130	30	30			
Dichlorodifluoromethane	75-71-8	10	0.915	ug/kg	30-146	30	30-146	30	30			
Acetone	67-64-1	10	4.811	ug/kg	54-140	30	54-140	30	30			

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.

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Langan Engineering & Environmental

TCL Volatiles - EPA 8260C/5035 High&Low (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - 1 Vial MeOH/2 Vial Water

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Carbon disulfide	75-15-0	10	4.55	ug/kg	59-130	30	59-130	30	30			
2-Butanone	78-93-3	10	2.22	ug/kg	70-130	30	70-130	30	30			
Vinyl acetate	108-05-4	10	2.15	ug/kg	70-130	30	70-130	30	30			
4-Methyl-2-pentanone	108-10-1	10	1.28	ug/kg	70-130	30	70-130	30	30			
1,2,3-Trichloropropane	96-18-4	2	0.127	ug/kg	68-130	30	68-130	30	30			
2-Hexanone	591-78-6	10	1.18	ug/kg	70-130	30	70-130	30	30			
Bromochloromethane	74-97-5	2	0.205	ug/kg	70-130	30	70-130	30	30			
2,2-Dichloropropane	594-20-7	2	0.202	ug/kg	70-130	30	70-130	30	30			
1,2-Dibromoethane	106-93-4	1	0.279	ug/kg	70-130	30	70-130	30	30			
1,3-Dichloropropane	142-28-9	2	0.167	ug/kg	69-130	30	69-130	30	30			
1,1,1,2-Tetrachloroethane	630-20-6	0.5	0.132	ug/kg	70-130	30	70-130	30	30			
Bromobenzene	108-86-1	2	0.145	ug/kg	70-130	30	70-130	30	30			
n-Butylbenzene	104-51-8	1	0.167	ug/kg	70-130	30	70-130	30	30			
sec-Butylbenzene	135-98-8	1	0.146	ug/kg	70-130	30	70-130	30	30			
tert-Butylbenzene	98-06-6	2	0.118	ug/kg	70-130	30	70-130	30	30			
o-Chlorotoluene	95-49-8	2	0.191	ug/kg	70-130	30	70-130	30	30			
p-Chlorotoluene	106-43-4	2	0.108	ug/kg	70-130	30	70-130	30	30			
1,2-Dibromo-3-chloropropane	96-12-8	3	0.998	ug/kg	68-130	30	68-130	30	30			
Hexachlorobutadiene	87-68-3	4	0.169	ug/kg	67-130	30	67-130	30	30			
Isopropylbenzene	98-82-8	1	0.109	ug/kg	70-130	30	70-130	30	30			
p-Isopropyltoluene	99-87-6	1	0.109	ug/kg	70-130	30	70-130	30	30			
Naphthalene	91-20-3	4	0.65	ug/kg	70-130	30	70-130	30	30			
Acrylonitrile	107-13-1	4	1.15	ug/kg	70-130	30	70-130	30	30			
n-Propylbenzene	103-65-1	1	0.171	ug/kg	70-130	30	70-130	30	30			
1,2,3-Trichlorobenzene	87-61-6	2	0.322	ug/kg	70-130	30	70-130	30	30			
1,2,4-Trichlorobenzene	120-82-1	2	0.272	ug/kg	70-130	30	70-130	30	30			
1,3,5-Trimethylbenzene	108-67-8	2	0.193	ug/kg	70-130	30	70-130	30	30			
1,2,4-Trimethylbenzene	95-63-6	2	0.334	ug/kg	70-130	30	70-130	30	30			
1,4-Dioxane	123-91-1	80	35.1	ug/kg	65-136	30	65-136	30	30			
1,4-Diethylbenzene	105-05-5	2	0.177	ug/kg	70-130	30	70-130	30	30			
4-Ethyltoluene	622-96-8	2	0.384	ug/kg	70-130	30	70-130	30	30			
1,2,4,5-Tetramethylbenzene	95-93-2	2	0.191	ug/kg	70-130	30	70-130	30	30			
Ethyl ether	60-29-7	2	0.341	ug/kg	67-130	30	67-130	30	30			
trans-1,4-Dichloro-2-butene	110-57-6	5	1.42	ug/kg	70-130	30	70-130	30	30			
1,2-Dichloroethane-d4	*17060-07-0*									*70-130*		
2-Chloroethoxyethane												
Toluene-d8	*2037-26-5*									*70-130*		
4-Bromofluorobenzene	*460-00-4*									*70-130*		
Dibromofluoromethane	*1868-53-7*									*70-130*		

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Langan Engineering & Environmental

NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Acenaphthene	83-32-9	133.6	17.3012	ug/kg	31-137	50	31-137	50	50			
1,2,4-Trichlorobenzene	120-82-1	167	19.1048	ug/kg	38-107	50	38-107	50	50			
Hexachlorobenzene	118-74-1	100.2	18.704	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroethyl)ether	111-44-4	150.3	22.6452	ug/kg	40-140	50	40-140	50	50			
2-Chloronaphthalene	91-58-7	167	16.5664	ug/kg	40-140	50	40-140	50	50			
1,2-Dichlorobenzene	95-50-1	167	29.9932	ug/kg	40-140	50	40-140	50	50			
1,3-Dichlorobenzene	541-73-1	167	28.724	ug/kg	40-140	50	40-140	50	50			
1,4-Dichlorobenzene	106-46-7	167	29.1582	ug/kg	28-104	50	28-104	50	50			
3,3'-Dichlorobenzidine	91-94-1	167	44.422	ug/kg	40-140	50	40-140	50	50			
2,4-Dinitrotoluene	121-14-2	167	33.4	ug/kg	40-132	50	40-132	50	50			
2,6-Dinitrotoluene	606-20-2	167	28.6572	ug/kg	40-140	50	40-140	50	50			
Fluoranthene	206-44-0	100.2	19.1716	ug/kg	40-140	50	40-140	50	50			
4-Chlorophenyl phenyl ether	7005-72-3	167	17.869	ug/kg	40-140	50	40-140	50	50			
4-Bromophenyl phenyl ether	101-55-3	167	25.4842	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroisopropyl)ether	108-60-1	200.4	28.5236	ug/kg	40-140	50	40-140	50	50			
Bis(2-chloroethoxy)methane	111-91-1	180.36	16.7334	ug/kg	40-117	50	40-117	50	50			
Hexachlorobutadiene	87-68-3	167	24.4488	ug/kg	40-140	50	40-140	50	50			
Hexachlorocyclopentadiene	77-47-4	477.62	151.302	ug/kg	40-140	50	40-140	50	50			
Hexachloroethane	67-72-1	133.6	27.0206	ug/kg	40-140	50	40-140	50	50			
Isophorone	78-59-1	150.3	21.6766	ug/kg	40-140	50	40-140	50	50			
Naphthalene	91-20-3	167	20.3406	ug/kg	40-140	50	40-140	50	50			
Nitrobenzene	98-95-3	150.3	24.716	ug/kg	40-140	50	40-140	50	50			
NitrosoDiPhenylAmine(NDPA)/DPA	86-30-6	133.6	19.0046	ug/kg	36-157	50	36-157	50	50			
n-Nitrosodi-n-propylamine	621-64-7	167	25.7848	ug/kg	32-121	50	32-121	50	50			
Bis(2-Ethylhexyl)phthalate	117-81-7	167	57.782	ug/kg	40-140	50	40-140	50	50			
Butyl benzyl phthalate	85-68-7	167	42.084	ug/kg	40-140	50	40-140	50	50			
Di-n-butylphthalate	84-74-2	167	31.6632	ug/kg	40-140	50	40-140	50	50			
Di-n-octylphthalate	117-84-0	167	56.78	ug/kg	40-140	50	40-140	50	50			
Diethyl phthalate	84-66-2	167	15.4642	ug/kg	40-140	50	40-140	50	50			
Dimethyl phthalate	131-11-3	167	35.07	ug/kg	40-140	50	40-140	50	50			
Benzo(a)anthracene	56-55-3	100.2	18.8042	ug/kg	40-140	50	40-140	50	50			
Benzo(a)pyrene	50-32-8	133.6	40.748	ug/kg	40-140	50	40-140	50	50			
Benzo(b)fluoranthene	205-99-2	100.2	28.1228	ug/kg	40-140	50	40-140	50	50			
Benzo(k)fluoranthene	207-08-9	100.2	26.72	ug/kg	40-140	50	40-140	50	50			
Chrysene	218-01-9	100.2	17.368	ug/kg	40-140	50	40-140	50	50			
Acenaphthylene	208-96-8	133.6	25.7848	ug/kg	40-140	50	40-140	50	50			
Anthracene	120-12-7	100.2	32.565	ug/kg	40-140	50	40-140	50	50			
Benzo(ghi)perylene	191-24-2	133.6	19.6392	ug/kg	40-140	50	40-140	50	50			
Fluorene	86-73-7	167	16.2324	ug/kg	40-140	50	40-140	50	50			
Phenanthrene	85-01-8	100.2	20.3072	ug/kg	40-140	50	40-140	50	50			
Dibenzo(a,h)anthracene	53-70-3	100.2	19.3052	ug/kg	40-140	50	40-140	50	50			
Indeno(1,2,3-cd)Pyrene	193-39-5	133.6	23.2798	ug/kg	40-140	50	40-140	50	50			

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NYTCL Semivolatiles - EPA 8270D (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Pyrene	129-00-0	100.2	16.5998	ug/kg	35-142	50	35-142	50	50			
Biphenyl	92-52-4	380.76	38.744	ug/kg	37-127	50	37-127	50	50			
4-Chloroaniline	106-47-8	167	30.394	ug/kg	40-140	50	40-140	50	50			
2-Nitroaniline	88-74-4	167	32.1976	ug/kg	47-134	50	47-134	50	50			
3-Nitroaniline	99-09-2	167	31.4962	ug/kg	26-129	50	26-129	50	50			
4-Nitroaniline	100-01-6	167	69.138	ug/kg	41-125	50	41-125	50	50			
Dibenzofuran	132-64-9	167	15.7982	ug/kg	40-140	50	40-140	50	50			
2-Methylnaphthalene	91-57-6	200.4	20.1736	ug/kg	40-140	50	40-140	50	50			
Acetophenone	98-86-2	167	20.6746	ug/kg	14-144	50	14-144	50	50			
2,4,6-Trichlorophenol	88-06-2	100.2	31.6632	ug/kg	30-130	50	30-130	50	50			
P-Chloro-M-Cresol	59-50-7	167	24.883	ug/kg	26-103	50	26-103	50	50			
2-Chlorophenol	95-57-8	167	19.7394	ug/kg	25-102	50	25-102	50	50			
2,4-Dichlorophenol	120-83-2	150.3	26.8536	ug/kg	30-130	50	30-130	50	50			
2,4-Dimethylphenol	105-67-9	167	55.11	ug/kg	30-130	50	30-130	50	50			
2-Nitrophenol	88-75-5	360.72	62.792	ug/kg	30-130	50	30-130	50	50			
4-Nitrophenol	100-02-7	233.8	68.136	ug/kg	11-114	50	11-114	50	50			
2,4-Dinitrophenol	51-28-5	801.6	77.822	ug/kg	4-130	50	4-130	50	50			
4,6-Dinitro-o-cresol	534-52-1	434.2	80.16	ug/kg	10-130	50	10-130	50	50			
Pentachlorophenol	87-86-5	133.6	36.74	ug/kg	17-109	50	17-109	50	50			
Phenol	108-95-2	167	25.217	ug/kg	26-90	50	26-90	50	50			
2-Methylphenol	95-48-7	167	25.885	ug/kg	30-130.	50	30-130.	50	50			
3-Methylphenol/4-Methylphenol	108-39-4/106-44-5	240.48	26.1522	ug/kg	30-130	50	30-130	50	50			
2,4,5-Trichlorophenol	95-95-4	167	31.9972	ug/kg	30-130	50	30-130	50	50			
Benzoic Acid	65-85-0	541.08	169.004	ug/kg	10-110	50	10-110	50	50			
Benzyl Alcohol	100-51-6	167	51.102	ug/kg	40-140	50	40-140	50	50			
Carbazole	86-74-8	167	16.2324	ug/kg	54-128	50	54-128	50	50			
1,4-Dioxane	123-91-1	25.05	7.682	ug/kg	40-140	50	40-140	50	50			
2-Fluorophenol	*367-12-4*									*25-120*		
Phenol-d6	*13127-88-3*									*10-120*		
Nitrobenzene-d5	*4165-60-0*									*23-120*		
2-Fluorobiphenyl	*321-60-8*									*30-120*		
2,4,6-Tribromophenol	*118-79-6*									*10-136*		
4-Terphenyl-d14	*1718-51-0*									*18-120*		

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Langan Engineering & Environmental

TCL Pesticides - EPA 8081B (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Delta-BHC	319-86-8	1.6008	0.31349	ug/kg	30-150	30	30-150	50	50			
Lindane	58-89-9	0.667	0.298149	ug/kg	30-150	30	30-150	50	50			
Alpha-BHC	319-84-6	0.667	0.189428	ug/kg	30-150	30	30-150	50	50			
Beta-BHC	319-85-7	1.6008	0.60697	ug/kg	30-150	30	30-150	50	50			
Heptachlor	76-44-8	0.8004	0.358846	ug/kg	30-150	30	30-150	50	50			
Aldrin	309-00-2	1.6008	0.563615	ug/kg	30-150	30	30-150	50	50			
Heptachlor epoxide	1024-57-3	3.0015	0.90045	ug/kg	30-150	30	30-150	50	50			
Endrin	72-20-8	0.667	0.27347	ug/kg	30-150	30	30-150	50	50			
Endrin aldehyde	7421-93-4	2.001	0.70035	ug/kg	30-150	30	30-150	50	50			
Endrin ketone	53494-70-5	1.6008	0.412206	ug/kg	30-150	30	30-150	50	50			
Dieldrin	60-57-1	1.0005	0.50025	ug/kg	30-150	30	30-150	50	50			
4,4'-DDE	72-55-9	1.6008	0.370185	ug/kg	30-150	30	30-150	50	50			
4,4'-DDD	72-54-8	1.6008	0.570952	ug/kg	30-150	30	30-150	50	50			
4,4'-DDT	50-29-3	3.0015	1.28731	ug/kg	30-150	30	30-150	50	50			
Endosulfan I	959-98-8	1.6008	0.378189	ug/kg	30-150	30	30-150	50	50			
Endosulfan II	33213-65-9	1.6008	0.534934	ug/kg	30-150	30	30-150	50	50			
Endosulfan sulfate	1031-07-8	0.667	0.317492	ug/kg	30-150	30	30-150	50	50			
Methoxychlor	72-43-5	3.0015	0.9338	ug/kg	30-150	30	30-150	50	50			
Toxaphene	8001-35-2	30.015	8.4042	ug/kg	30-150	30	30-150	50	50			
cis-Chlordane	5103-71-9	2.001	0.557612	ug/kg	30-150	30	30-150	50	50			
trans-Chlordane	5103-74-2	2.001	0.528264	ug/kg	30-150	30	30-150	50	50			
Chlordane	57-74-9	13.0065	5.30265	ug/kg	30-150	30	30-150	50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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Langan Engineering & Environmental

TCL PCBs - EPA 8082A (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Aroclor 1016	12674-11-2	33.5	2.9748	ug/kg	40-140	50	40-140	50	50			
Aroclor 1221	11104-28-2	33.5	3.3567	ug/kg	40-140	50	40-140	50	50			
Aroclor 1232	11141-16-5	33.5	7.102	ug/kg	40-140	50	40-140	50	50			
Aroclor 1242	53469-21-9	33.5	4.5158	ug/kg	40-140	50	40-140	50	50			
Aroclor 1248	12672-29-6	33.5	5.025	ug/kg	40-140	50	40-140	50	50			
Aroclor 1254	11097-69-1	33.5	3.6649	ug/kg	40-140	50	40-140	50	50			
Aroclor 1260	11096-82-5	33.5	6.1908	ug/kg	40-140	50	40-140	50	50			
Aroclor 1262	37324-23-5	33.5	4.2545	ug/kg	40-140	50	40-140	50	50			
Aroclor 1268	11100-14-4	33.5	3.4706	ug/kg	40-140	50	40-140	50	50			
PCBs, Total	1336-36-3	33.5	2.9748	ug/kg				50	50			
2,4,5,6-Tetrachloro-m-xylene	*877-09-8*									*30-150*		
Decachlorobiphenyl	*2051-24-3*									*30-150*		

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Herbicides -EPA 8151A (SOIL)

Holding Time: 14 days
Container/Sample Preservation: 1 - Glass 250ml/8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
2,4-D	94-75-7	0.1665	0.0104895	mg/kg	30-150	30	30-150	30	30			
2,4,5-T	93-76-5	0.1665	0.0051615	mg/kg	30-150	30	30-150	30	30			
2,4,5-TP (Silvex)	93-72-1	0.1665	0.0044289	mg/kg	30-150	30	30-150	30	30			
DCAA	*19719-28-9*									*30-150*		

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METALS by 6010D (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Aluminum, Total	7429-90-5	4	1.08	mg/kg	48-151		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Antimony, Total	7440-36-0	2	0.152	mg/kg	1-208		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Arsenic, Total	7440-38-2	0.4	0.0832	mg/kg	79-121		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Barium, Total	7440-39-3	0.4	0.0696	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Beryllium, Total	7440-41-7	0.2	0.0132	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Cadmium, Total	7440-43-9	0.4	0.0392	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Calcium, Total	7440-70-2	4	1.4	mg/kg	81-119		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Chromium, Total	7440-47-3	0.4	0.0384	mg/kg	80-120		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Cobalt, Total	7440-48-4	0.8	0.0664	mg/kg	84-115		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Copper, Total	7440-50-8	0.4	0.1032	mg/kg	81-118		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Iron, Total	7439-89-6	2	0.3612	mg/kg	45-155		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Lead, Total	7439-92-1	2	0.1072	mg/kg	81-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Magnesium, Total	7439-95-4	4	0.616	mg/kg	76-124		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Manganese, Total	7439-96-5	0.4	0.0636	mg/kg	81-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Nickel, Total	7440-02-0	1	0.0968	mg/kg	83-117		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Potassium, Total	7440-09-7	100	5.76	mg/kg	71-129		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Selenium, Total	7782-49-2	0.8	0.1032	mg/kg	78-122		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Silver, Total	7440-22-4	0.4	0.1132	mg/kg	75-124		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Sodium, Total	7440-23-5	80	1.26	mg/kg	72-127		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Thallium, Total	7440-28-0	0.8	0.126	mg/kg	80-120		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Vanadium, Total	7440-62-2	0.4	0.0812	mg/kg	78-122		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved
Zinc, Total	7440-66-6	2	0.1172	mg/kg	82-118		75-125	20	20		180 days	1 - Metals Only-Glass 60mL/2oz unpreserved

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METALS by 7471B (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria	Holding Time	Container/Sample Preservation
Mercury, Total	7439-97-6	0.08	0.05216	mg/kg	72-128		80-120	20	20		28 days	1 - Metals Only-Glass 60mL/2oz unpreserved

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Langan Engineering & Environmental

WETCHEM (SOIL)

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Method	Holding Time	Container/Sample Preservation
Chromium, Hexavalent	18540-29-9	0.8	0.16	mg/kg	80-120	20	75-125	20	20	7196A	30 days	1 - Glass 120ml/4oz unpreserved
Cyanide, Total	57-12-5	1	0.212	mg/kg	80-120	35	75-125	35	35	9010C/9012B	14 days	1 - Glass 250ml/8oz unpreserved

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PFAAs via EPA 1633 (Draft) (SOIL)

Holding Time: 90 days
Container/Sample Preservation: 1 - Plastic 8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluorobutanoic Acid (PFBA)	375-22-4	0.8	0.0504	ng/g	40-150	30	40-150	30	30			
Perfluoropentanoic Acid (PFPeA)	2706-90-3	0.4	0.056	ng/g	40-150	30	40-150	30	30			
Perfluorobutanesulfonic Acid (PFBS)	375-73-5	0.2	0.0432	ng/g	40-150	30	40-150	30	30			
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	757124-72-4	0.8	0.0808	ng/g	40-150	30	40-150	30	30			
Perfluorohexanoic Acid (PFHxA)	307-24-4	0.2	0.0464	ng/g	40-150	30	40-150	30	30			
Perfluoropentanesulfonic Acid (PFPeS)	2706-91-4	0.2	0.0232	ng/g	40-150	30	40-150	30	30			
Perfluoroheptanoic Acid (PFHpA)	375-85-9	0.2	0.0232	ng/g	40-150	30	40-150	30	30			
Perfluorohexanesulfonic Acid (PFHxS)	355-46-4	0.2	0.0592	ng/g	40-150	30	40-150	30	30			
Perfluorooctanoic Acid (PFOA)	335-67-1	0.2	0.052	ng/g	40-150	30	40-150	30	30			
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	27619-97-2	0.8	0.28	ng/g	40-150	30	40-150	30	30			
Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	0.2	0.0368	ng/g	40-150	30	40-150	30	30			
Perfluorononanoic Acid (PFNA)	375-95-1	0.2	0.0784	ng/g	40-150	30	40-150	30	30			
Perfluorooctanesulfonic Acid (PFOS)	1763-23-1	0.2	0.0792	ng/g	40-150	30	40-150	30	30			
Perfluorodecanoic Acid (PFDA)	335-76-2	0.2	0.0752	ng/g	40-150	30	40-150	30	30			
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	39108-34-4	0.8	0.3872	ng/g	40-150	30	40-150	30	30			
Perfluorononanesulfonic Acid (PFNS)	68259-12-1	0.2	0.0424	ng/g	40-150	30	40-150	30	30			
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA	2355-31-9	0.2	0.1	ng/g	40-150	30	40-150	30	30			
Perfluoroundecanoic Acid (PFUnA)	2058-94-8	0.2	0.0512	ng/g	40-150	30	40-150	30	30			
Perfluorodecanesulfonic Acid (PFDS)	335-77-3	0.2	0.032	ng/g	40-150	30	40-150	30	30			
Perfluorooctanesulfonamide (FOSA)	754-91-6	0.2	0.0432	ng/g	40-150	30	40-150	30	30			
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	2991-50-6	0.2	0.0824	ng/g	40-150	30	40-150	30	30			
Perfluorododecanoic Acid (PFDoA)	307-55-1	0.2	0.0408	ng/g	40-150	30	40-150	30	30			
Perfluorotridecanoic Acid (PFTrDA)	72629-94-8	0.2	0.0528	ng/g	40-150	30	40-150	30	30			
Perfluorotetradecanoic Acid (PFTA)	376-06-7	0.2	0.1064	ng/g	40-150	30	40-150	30	30			
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Pro	13252-13-6	0.8	0.0984	ng/g	40-150	30	40-150	30	30			
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	919005-14-4	0.8	0.1464	ng/g	40-150	30	40-150	30	30			
Perfluorododecane Sulfonic Acid (PFDoDS)	79780-39-5	0.2	0.0384	ng/g	40-150	30	40-150	30	30			
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3	756426-58-1	0.8	0.196	ng/g	40-150	30	40-150	30	30			
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-	763051-92-9	0.8	0.1672	ng/g	40-150	30	40-150	30	30			
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	31506-32-8	0.2	0.1	ng/g	40-150	30	40-150	30	30			
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	4151-50-2	0.2	0.112	ng/g	40-150	30	40-150	30	30			
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	24448-09-7	2	0.2504	ng/g	40-150	30	40-150	30	30			
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	1691-99-2	2	0.5104	ng/g	40-150	30	40-150	30	30			
Perfluoro-3-Methoxypropanoic Acid (PFMPA)	377-73-1	0.4	0.0408	ng/g	40-150	30	40-150	30	30			
Perfluoro-4-Methoxybutanoic Acid (PFMBA)	863090-89-5	0.4	0.0312	ng/g	40-150	30	40-150	30	30			
Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA)	113507-82-7	0.4	0.0832	ng/g	40-150	30	40-150	30	30			
Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA)	151772-58-6	0.4	0.0952	ng/g	40-150	30	40-150	30	30			
3-Perfluoropropyl Propanoic Acid (3:3FTCA)	356-02-5	1	0.144	ng/g	40-150	30	40-150	30	30			
2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA)	914637-49-3	5	0.5048	ng/g	40-150	30	40-150	30	30			
3-Perfluoroheptyl Propanoic Acid (7:3FTCA)	812-70-4	5	1.76	ng/g	40-150	30	40-150	30	30			
Perfluoro[13C4]Butanoic Acid (MPFBA)	*NONE*									*20-150*		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	*NONE*									*20-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
Please Note that the information provided in this table is subject to change at anytime at the discretion of Alpha Analytical, Inc.

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Langan Engineering & Environmental

PFAAs via EPA 1633 (Draft) (SOIL)

Holding Time: 90 days
Container/Sample Preservation: 1 - Plastic 8oz unpreserved

Analyte	CAS #	RL	MDL	Units	LCS Criteria	LCS RPD	MS Criteria	MS RPD	Duplicate RPD	Surrogate Criteria		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	*NONE*									*20-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4	*NONE*									*20-150*		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	*NONE*									*20-150*		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	*NONE*									*20-150*		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	*NONE*									*20-150*		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	*NONE*									*20-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6.	*NONE*									*20-150*		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	*NONE*									*20-150*		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	*NONE*									*20-150*		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	*NONE*									*20-150*		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8	*NONE*									*20-150*		
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (	*NONE*									*20-150*		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	*NONE*									*20-150*		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	*NONE*									*20-150*		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d.	*NONE*									*20-150*		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	*NONE*									*20-150*		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	*NONE*									*20-150*		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-13	*NONE*									*20-150*		
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (d3-NMeFOSA)	*NONE*									*20-150*		
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (d5-NEtFOSA)	*NONE*									*20-150*		
2-(N-Methyl-d3-Perfluoro-1-Octanesulfonamido)ethan-d4-ol	*1265205-95-5*									*20-150*		
2-(N-Ethyl-d5-Perfluoro-1-Octanesulfonamido)ethan-d4-ol (d	*NONE*									*20-150*		

Please Note that the RL information provided in this table is calculated using a 100% Solids factor. (Soil/Solids only)
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ATTACHMENT C

Analytical Methods / Quality Assurance Summary Table

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ATTACHMENT C
ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

Matrix Type	Field Parameters	Laboratory Parameters	Analytical Methods	Sample Preservation	Sample Container Volume and Type	Sample Hold Time	Number of Samples to be Collected	Field Duplicate Samples	Equipment Blank Samples	Trip Blank Samples	Ambient Air Samples	MS/MSD Samples
Soil	Total VOCs via PID	Part 375 + TCL VOCs / CP-51 VOCs	EPA 8260C	Cool to 4°C	Two 40-ml VOC vials with 5ml H_2O, one with MeOH or 3 Encore Samplers (separate container for % solids)	14 days, freeze at lab within 48 hours	21	1 per 20 samples (minimum 1)	1 per 20 samples, if needed (minimum 1, if needed)	1 per shipment of VOC samples	NA	1 per 20 samples (minimum 1)
		Part 375 + TCL SVOCs / CP-51 SVOCs	EPA 8270D	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis						
		1,4-Dioxane	EPA 8270D	Cool to 4°C	8 oz. jar	14 days extract, 40 days after extraction to analysis						
		Part 375 + TAL Metals	EPA 6010C, EPA 7470, EPA 7196A, EPA 9014/9010C	Cool to 4°C	2 oz. jar*	6 months, except Mercury 28 days						
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	2 oz. jar*	28 days						
		Perfluoroalkyl Substances (PFAs)	EPA 1633	Cool to 4°C	8 ounce HDPE container	90 days						
		Part 375 + TCL Herbicides	EPA 8151A	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis						
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis						
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	4 oz. jar*	14 days extract, 40 days after extraction to analysis						
Groundwater	Headspace VOCs via PID, synoptic groundwater level measurement, Temperature, Turbidity, pH, ORP, Conductivity	Part 375 + TCL VOCs	EPA 8260C	Cool to 4°C; HCl to pH <2;no headspace	Three 40-mL VOC vials with Teflon®-lined cap	14 days	0	1 per 20 samples (minimum 1)	1 per 20 samples, if needed (minimum 1, if needed)	1 per shipment of VOC samples	NA	1 per 20 samples (minimum 1)
		Part 375 + TCL SVOCs / CP-51 SVOCs	EPA 8270D	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extract, 40 days after extraction to analysis						
		1,4-Dioxane	EPA 8270D SIM	Cool to 4°C	1-L Amber Glass	7 days to extract, 40 days after extraction to analysis						
		Part 375 + TAL Metals	EPA 6010C, EPA 7470, EPA 7196A, EPA 9014/9010C	Cool to 4°C	Two 1-Liter Amber Glass	6 months, except Mercury 28 days						
		Hexavalent Chromium	EPA 7196A	Cool to 4°C	250 mL Plastic	24 hours						
		Perfluoroalkyl Substances (PFAs)	EPA 1633	Cool to 4°C	Three 500mL HDPE containers	28 Days						
		Part 375 + TCL Herbicides	EPA 8151A	Cool to 4°C	Two 1-Liter Amber Glass	7 days to extraction, 40 days after extraction to analysis						
		Part 375 + TCL Pesticides	EPA 8081B	Cool to 4°C	Two 1-Liter Amber Glass	7 days extract, 40 days after extraction to analysis						
		Part 375 + TCL PCBs	EPA 8082A	Cool to 4°C	Two 1-Liter Amber Glass	7 days extract, 40 days after extraction to analysis						
Soil Vapor	Total VOCs via PID	Part 375 + TCL VOCs	EPA TO-15	NA	6L Summa Cannister	30 days	0	1 per 20 samples (minimum 1)	NA	NA	1 per day	NA

Notes:
*can be combined in one or more 8 oz. jars
mL = milliliter
VOC = Volatile organic compound
SVOC = Semi-volatile organic compound
PCB = Polychlorinated biphenyls
TAL = Total Analyte List
TCL = Target Criteria List

PID = Photoionization detector
Part 375 = New York State Department of Environmental Conservation (NYSDEC) Title 6 New York City Rules and Regulation (NYCRR) Part 375 List.
ORP = Oxidation reduction potential
EPA = U.S. Environmental Protection Agency
NA = Not applicable
ºC = degree Celsius

The PFAS compounds to be analyzed includes: perfluorobutanesulfonic acid, perfluorohexanesulfonic acid, perfluoroheptanesulfonic acid, perfluorooctanessulfonic acid, perfluorodecanesulfonic acid, perfluorobutanoic acid, perfluoropentanoic acid, perfluorohexanoic acid, perfluoroheptanoic acid, perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, perfluoroundecanoic acid, perfluorododecanoic acid, perfluorotridecanoic acid, perfluorotetradecanoic acid, 6:2 fluorotelomer sulfonate, 8:2 fluorotelomer sulfonate, perfluroroctanesulfonamide, n-methyl perfluorooctanesulfonamidoacetic acid, and n-ethyl perfluorooctanesulfonamidoacetic acid.

ATTACHMENT D

Sample Nomenclature

Requirements for Sample Nomenclature

The recommendations for sample nomenclature outlined below provide for consistency between sample events and projects but, most importantly, establish unique sample IDs that will avoid confusion months or years after the sample has been collected. Furthermore, unique sample IDs are required for any data submitted to the NYSDEC in EDD format or being uploaded to an EQuIS database.

Soil and Sediment Samples

SBxx_y-y

Sample Location + Number (two digits minimum)

Sampling Interval (y-y)

Sample Type	Sample Location	Sample Depth (feet bgs)	Sample Name
Phase II/Remedial Investigation			
Grab	SB01	2 to 4	**SB01_2-4**
	SB02	4	**SB02_4**
Waste Characterization			
Grab	WC01	2 to 4	**WC01_2-4**
	WC02	4	**WC02_4**
Composite	WC01 + WC02	0 to 10	**COMP01_0-10**
Endpoint Sampling			
Grab	EPSW01_N	5	**EPSW01_N_5**
	EPSW01_S	5	**EPSW01_S_5**
	EPSW01_E	5	**EPSW01_E_5**
	EPSW01_W	5	**EPSW01_W_5**
	EPB01	6	**EPB01_6**

- Boring ID (**SB01**_0-0.5) is a sequential number (starting with 01) and should be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (SB01**A**, not SB1A).
- Sample Interval (SB01_**0-0.5**) is separated from the boring ID with an underscore, and the top and bottom interval with a dash. Soil and sediment sample intervals should always be in feet.

Groundwater and Surface Water Samples

MWxx_MMDDYY

Sample Location + Number (two digits minimum)

Sample Date (MMDDYY)

Sample Type	Sample Location	Sample Date	Sample Name
Groundwater Sample	MW01	02/21/2013	**MW01_022113**
Surface Water Sample	SW01	02/21/2013	**SW01_022113**

- Well ID or surface water gauge ID (**MW01**_022113) is the common well name and should be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (MW01**A**, not MW1A).
- Sample date (MW01**_022113**) is separated from the well ID (or gauge location) with an underscore and should be provided in MMDDYY format [the date can not contain "/" or "-"].
- If groundwater samples are collected from multiple intervals within one well, you may assign a letter designation (in lower case) to the well ID to differentiate between intervals (i.e., MW01a_022113, MW01b_022113, and MW01c_022113). The letter "a" would indicate the shallowest interval and "c" the deepest. The actual depth intervals should be documented in the project field book or field sheets and the letter designations should be used consistently between sampling events.

Vapor Investigation Samples

IAxx_MMDDYY

Sample Location + Number (two digits minimum)

Sample Date (MMDDYY)

Sample Type	Sample Location	Sample Date	Sample Name
Ambient Air Sample	AA01	02/21/2013	**AA01_022113**
Air Sample	IA01	02/21/2013	**IA01_022113**
Soil Vapor Sample	SV01	02/21/2013	**SV01_022113**
Vapor Extraction Well Sample	SVE01 (Inlet/Midpoint/Outlet)	02/21/2013	**SVE01_IN_022113** **SVE01_ MID_022113** **SVE01_ OUT_022113**

- Sample number (**IA01**_022113) should be separated from the sample date by an underscore. Sample numbers should be sequential in order and be a minimum of two digits. Any additional characters do not count as part of the 2-digit minimum (IA01**A**, not IA1A). The location of each sequential sample number should be documented/ illustrated in project field books or field sheets.
- Sample date (IA01_**022113**) is separated from the sample number with an underscore and should be provided in MMDDYY format [the date can not contain "/" or "-"].
- Ambient air samples also need their own unique sample location name. If you revisit a previous ambient air sample location, you can reuse the location name with the new sample date appended to the end.

Duplicate Samples

Sample Type	Parent Sample Code	Date	Sample Name
Groundwater Duplicate Sample (DUP)	MW01_022113	02/21/2013	**DUP01_022113**

Field Blanks and Trip Blanks

Sample Type	Date	Sample Name
Equipment Blank (EB)	02/21/2013	**EB01_022113**
Field Blank (FB)	02/21/2013	**FB01_022113**
Trip Blank (TB)	02/21/2013	**TB01_022113**

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Sample Type	Sample Location	Parent Sample Name	Sample Name
Matrix Spike (MS)	SB01	SB01_2-4	**SB01_2-4MS**
Matrix Spike Duplicate (MSD)	SB01	SB01_2-4	**SB01_2-4MSD**

NOTES

1. Spaces should not be used in sample names.
2. Special characters should not be used in report naming with the exception of – and _.
3. Letter designations should be used consistently between sampling events.
4. According to USEPA's Contract Laboratory Program (CLP) Guidance for Field Samplers (January 2011), field duplicate samples should remain "blind" to the laboratory (i.e., they should have separate CLP Sample numbers). Assign two separate (unique) CLP sample numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory.

ATTACHMENT E

Laboratory Standard Operating Procedures for PFAS Analysis

LANGAN

Method 1633 Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids and Tissue Samples by LC-MS/MS

References: Method 1633 - Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS (2nd Draft - June 2022)

DOD QSM (US Department of Defense Quality Systems Manual for Environmental Laboratories, version 5.4, 20221)

1. Scope and Application

Matrices: Drinking water, Non-potable Water, Tissues, Biosolids and Soil Matrices

Definitions: Refer to Alpha Analytical Quality Manual.

1.1 Method 1633 is for use in the Clean Water Act (CWA) for the determination of the per- and polyfluoroalkyl substances (PFAS) in Table 1 in aqueous, solid (soil, biosolids, sediment) and tissue samples by liquid chromatography/mass spectrometry (LC-MS/MS).

1.2 The method calibrates and quantifies PFAS analytes using isotopically labeled standards. Where linear and branched isomers are present in the sample and either qualitative or quantitative standards containing branched and linear isomers are commercially available, the PFAS analyte is reported as a single analyte consisting of the sum of the linear and branched isomer concentrations

1.3 This is a liquid chromatography/tandem mass spectrometry (LC/MS/MS) method for the determination of selected perfluorinated alkyl substances (PFAS) in Non-Drinking Water, tissue soil and biosolid Matrices. Accuracy and precision data have been generated for the compounds listed in Table 1.

1.4 The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.

1.5 This method is restricted to use by or under the supervision of analysts experienced in the operation of the LC/MS/MS and in the interpretation of LC/MS/MS data. Each analyst must demonstrate the ability to generate acceptable results with this method by performing an initial demonstration of capability.

2. Summary of Method

2.1 Environmental samples are prepared and extracted using method-specific procedures. Sample extracts are subjected to cleanup procedures designed to remove interferences. Analyses of the sample extracts are conducted by LC-MS/MS in the multiple reaction monitoring (MRM) mode. Sample concentrations are determined by isotope dilution or extracted internal standard quantification using isotopically labeled compounds added to the samples before extraction.

2.2 Aqueous samples are spiked with isotopically labeled standards, extracted using solid-phase extraction (SPE) cartridges and undergo cleanup using carbon before analysis.

2.3 Solid samples are spiked with isotopically labeled standards, extracted into basic methanol, and cleaned up by carbon and SPE cartridges before analysis

2.4 Tissue samples are spiked with isotopically labeled standards, extracted in potassium hydroxide and acetonitrile followed by basic methanol, and cleaned up by carbon and SPE cartridges before analysis.

2.5 A sample extract is injected into an LC equipped with a C18 column that is interfaced to an MS/MS). The analytes are separated and identified by comparing the acquired mass spectra and retention times to reference spectra and retention times for calibration standards acquired under identical LC/MS/MS conditions. The concentration of each analyte is determined by using the isotope dilution technique. Extracted Internal Standards (EIS) analytes are used to monitor the extraction efficiency of the method analytes.

2.6 Method Modifications from Reference

N/A

3. Reporting Limits

The reporting limit for PFAS's are listed in Table 8.

4. Interferences

4.1 PFAS standards, extracts and samples should not come in contact with any glass containers or pipettes as these analytes can potentially adsorb to glass surfaces. PFAS analyte and EIS standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers.

4.2 Method interferences may be caused by contaminants in solvents, reagents (including reagent water), sample bottles and caps, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. The method analytes in this method can also be found in many common laboratory supplies and equipment, such as PTFE (polytetrafluoroethylene) products, LC solvent lines, methanol, aluminum foil, SPE sample transfer lines, etc. All items such as these must be routinely demonstrated to be free from interferences (less than 1/2 the RL for each method analyte) under the conditions of the analysis by analyzing laboratory reagent blanks as described in Section 9.1. Subtracting blank values from sample results is not permitted.

4.3 Matrix interferences may be caused by contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the water. Humic and/or fulvic material can be co-extracted during SPE and high levels can cause enhancement and/or suppression in the electrospray ionization source or low recoveries on the SPE sorbent. Total organic carbon (TOC) is a good indicator of humic content of the sample.

4.4 SPE cartridges can be a source of interferences. The analysis of field and laboratory reagent blanks can provide important information regarding the presence or absence of such interferences. Brands and lots of SPE devices should be tested to ensure that contamination does not preclude analyte identification and quantitation.

5. Health and Safety

5.1 The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

5.2 All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

5.3 PFOA has been described as “likely to be carcinogenic to humans.” Pure standard materials and stock standard solutions of these method analytes should be handled with suitable protection to skin and eyes, and care should be taken not to breathe the vapors or ingest the materials.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection for Aqueous Samples

6.1.1 Samples must be collected in two (2) 500-mL or 250-mL high density polyethylene (HDPE) container with an unlined plastic screw cap. All sample containers must have linerless HDPE or polypropylene caps.

6.1.2 The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. PFAS contamination during sampling can occur from a number of common sources, such as food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will aid in minimizing this type of accidental contamination of the samples.

6.1.3 Open the tap and allow the system to flush until the water temperature has stabilized (approximately 3 to 5 min). Collect samples from the flowing system.

6.1.4 Fill sample bottles. Samples do not need to be collected headspace free.

6.1.5 After collecting the sample and cap the bottle. Keep the sample sealed from time of collection until extraction.

6.1.6 Maintain all aqueous samples protected from light at 0 - 6 ºC from the time of collection until shipped to the laboratory. Samples must be shipped as soon as practical with sufficient ice to maintain the sample temperature below 6 ºC during transport and be received by the laboratory within 48 hours of collection. The laboratory must confirm that the sample temperature is 0 - 6 ºC upon receipt. Once received by the laboratory, the samples must be stored at ≤ -20 ºC until sample preparation.

6.2 Sample Collection for Soil and Sediment samples.

6.2.1 Grab samples are collected in polypropylene containers. Sample containers and contact surfaces containing PTFE shall be avoided. Samples should fill no more than ¾ full.

6.2.2 Maintain solid samples protected from light (in HDPE containers) at 0 - 6 ºC from the time of collection until receipt at the laboratory. The laboratory must confirm that the sample temperature is 0 - 6 ºC upon receipt. Once received by the laboratory, the samples must be stored at ≤ -20 ºC until sample preparation.

6.3 Sample Collection for fish and other tissue samples

6.3.1 Once received by the laboratory, the samples must be maintained protected from light at ≤ -20 ºC until prepared. Store unused samples in HDPE containers or wrapped in aluminum foil at ≤ -20 ºC.

6.3.2 The nature of the tissues of interest may vary by project. Field sampling plans and protocols should explicitly state the samples to be collected and if any processing will be conducted in the field (e.g., filleting of whole fish or removal of organs). All field procedures must involve materials and equipment that have been shown to be free of PFAS.

6.4 Sample Preservation

Not applicable.

6.5 Sample Shipping

Samples must be chilled during shipment and must not exceed 0 – 6 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 0 – 6 °C when the samples are received at the laboratory. Samples stored in the lab must be held at or below 6 °C until extraction but should not be frozen.

NOTE: Samples that are significantly above 0 – 6 ° C, at the time of collection, may need to be iced or refrigerated for a period of time, in order to chill them prior to shipping. This will allow them to be shipped with sufficient ice to meet the above requirements.

6.6 Sample Handling

6.6.1 Aqueous samples (including leachates) should be analyzed as soon as possible; however, samples may be held in the laboratory for up to 90 days from collection, when stored at ≤ -20 ºC and protected from the light. When stored at 0 - 6 ºC and protected from the light, aqueous samples may be held for up to 28 days, with the caveat that issues were observed with certain perfluorooctane sulfonamide ethanols and perfluorooctane sulfonamidoacetic acids after 7 days. These issues are more likely to elevate the observed concentrations of other PFAS compounds via the transformation of these precursors if they are present in the sample.

6.6.2 Solid samples (soils and sediments) and tissue samples may be held for up to 90 days, if stored by the laboratory in the dark at either 0 - 6 ºC or ≤ -20 ºC, with the caveat that samples may need to be extracted as soon as possible if NFDHA is an important analyte.

6.6.3 Biosolids samples may be held for up to 90 days, if stored by the laboratory in the dark at 0 - 6 ºC or at -20 ºC. Because microbiological activity in biosolids samples at 0 - 6 ºC may lead to production of gases which may cause the sample to be expelled from the container when it is opened, as well as producing noxious odors, EPA recommends that samples be frozen if they need to be stored for more than a few days before extraction. Store sample extracts in the dark at less than 0 - 4 ºC until analyzed. If stored in the dark at less than 0 - 4 ºC, sample extracts may be stored for up to 90 days, with the caveat that issues were observed for some ether sulfonates after 28 days. These issues may elevate the observed concentrations of the ether sulfonates in the extract over time. Samples may need to be extracted as soon as possible if NFDHA is an important analyte.

7. Equipment and Supplies

7.1 SAMPLE CONTAINERS – 500-mL or 250-mL high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

7.2 SAMPLE JARS – 8-ounce wide mouth high density polyethylene (HDPE) bottles fitted with unlined screw caps. Sample bottles must be discarded after use.

7.3 POLYPROPYLENE BOTTLES – 4-mL narrow-mouth polypropylene bottles.

7.4 CENTRIFUGE TUBES – 50-mL conical polypropylene tubes with polypropylene screw caps for storing standard solutions and for collection of the extracts.

7.5 AUTOSAMPLER VIALS – Polypropylene 0.7-mL autosampler vials with polypropylene caps.

7.5.1 NOTE: Polypropylene vials and caps are necessary to prevent contamination of the sample from PTFE coated septa. However, polypropylene caps do not reseal, so evaporation occurs after injection. Thus, multiple injections from the same vial are not possible.

7.6 POLYPROPYLENE GRADUATED CYLINDERS – Suggested sizes include 25, 50, 100 and 1000-mL cylinders.

7.7 Auto Pipets – Suggested sizes include 5, 10, 25, 50, 100, 250, 500, 1000, 5000 and 10,000-µls.

7.8 PLASTIC PIPETS – Polypropylene or polyethylene disposable pipets.

7.9 Silanized glass wool (Sigma-Aldrich, Cat # 20411 or equivalent) – store in a clean glass jar and rinsed with methanol (2 times) prior to use.

7.10 Disposable syringe filter, 25-mm, 0.2-µm Nylon membrane, PALL/Acrodisc or equivalent

7.11 Variable volume pipettes with disposable HDPE or polypropylene tips (10 µL to 5 mL) used for preparation of calibration standards and spiked samples.

7.12 ANALYTICAL BALANCE – Capable of weighing to the nearest 0.0001 g.

7.13 ANALYTICAL BALANCE – Capable of weighing to the nearest 0.1 g.

7.14 SOLID PHASE EXTRACTION (SPE) APPARATUS FOR USING CARTRIDGES

7.14.1 SPE CARTRIDGES – (Waters Oasis WAX 150 mg, Cat # 186002493 or equivalent). The SPE sorbent must have a pKa above 8 so that it remains positively charged during the extraction.

7.14.1.1 Note: SPE cartridges with different bed volume (e.g., 500 mg) may be used; however, the laboratory must demonstrate that the bed volume does not negatively affect analyte absorption and elution, by performing the initial demonstration of capability analyses described in Section.

7.14.2 VACUUM EXTRACTION MANIFOLD – A manual vacuum manifold with large volume sampler for cartridge extractions, or an automatic/robotic sample preparation system designed for use with SPE cartridges, may be used if all QC requirements discussed in Section 9 are met. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. Care must be taken with automated SPE systems to ensure the PTFE commonly used in these systems does not contribute to unacceptable analyte concentrations in the MB.

7.14.3 SAMPLE DELIVERY SYSTEM – Use of a polypropylene transfer tube system, which transfers the sample directly from the sample container to the SPE cartridge, is recommended, but not mandatory. Standard extraction manifolds come equipped with PTFE transfer tube systems. These can be replaced with 1/8” O.D. x 1/16” I.D. polypropylene or polyethylene tubing cut to an appropriate length to ensure no sample contamination from the sample transfer lines. Other types of non-PTFE tubing may be used provided it meets the MB and LCS QC requirements.

7.15 EXTRACT CONCENTRATION SYSTEM – Extracts are concentrated by evaporation with nitrogen using a water bath set no higher than 55 °C.

7.16 LABORATORY OR ASPIRATOR VACUUM SYSTEM – Sufficient capacity to maintain a vacuum of approximately 10 to 15 inches of mercury for extraction cartridges.

7.17 LIQUID CHROMATOGRAPHY (LC)/TANDEM MASS SPECTROMETER (MS/MS) WITH DATA SYSTEM

7.17.1 LC SYSTEM – Instrument capable of reproducibly injecting up to 10-µL aliquots and performing binary linear gradients at a constant flow rate near the flow rate used for development of this method (0.4 mL/min). The LC must be capable of pumping the water/methanol mobile phase without the use of a degasser which pulls vacuum on the mobile phase bottle (other types of degassers are acceptable). Degassers which pull vacuum on the mobile phase bottle will volatilize the ammonium acetate mobile phase causing the analyte peaks to shift to earlier retention times over the course of the analysis batch. The usage of a column heater is optional.

7.17.2 LC/TANDEM MASS SPECTROMETER – The LC/MS/MS must be capable of negative ion electrospray ionization (ESI) near the suggested LC flow rate of 0.4 mL/min. The system must be capable of performing MS/MS to produce unique product ions for the method analytes within specified retention time segments. A minimum of 10 scans across the chromatographic peak is required to ensure adequate precision.

7.17.3 DATA SYSTEM – An interfaced data system is required to acquire, store, reduce, and output mass spectral data. The computer software should have the capability of processing stored LC/MS/MS data by recognizing an LC peak within any given retention time window. The software must allow integration of the ion

abundance of any specific ion within specified time or scan number limits. The software must be able to calculate relative response factors, construct linear regressions or quadratic calibration curves, and calculate analyte concentrations.

7.17.4 INSTRUMENT COLUMNS

7.17.4.1 ANALYTICAL: C18 column, 1.7 µm, 50 x 2.1 mm (Waters Acquity UPLC® BEH or equivalent)

7.17.4.2 OPTIONAL GUARD COLUMN: (Phenomenex Kinetex® Evo C18 or equivalent)

8. Reagents and Standards

8.1 GASES, REAGENTS, AND SOLVENTS – Reagent grade or better chemicals must be used.

8.1.1 REAGENT WATER – Purified water which does not contain any measurable quantities of any method analytes or interfering compounds greater than 1/2 the RL for each method analyte of interest. Prior to daily use, at least 3 L of reagent water should be flushed from the purification system to rinse out any build-up of analytes in the system's tubing.

8.1.2 METHANOL (CH_3OH, CAS#: 67-56-1) – High purity, demonstrated to be free of analytes and interferences.

8.1.3 AMMONIUM ACETATE ($NH_4C_2H_3O_2$, CAS#: 631-61-8) – High purity, demonstrated to be free of analytes and interferences.

8.1.4 ACETIC ACID (H_3CCOOH, CAS#: 64-19-7) - High purity, demonstrated to be free of analytes and interferences.

8.1.5 1M AMMONIUM ACETATE/REAGENT WATER – High purity, demonstrated to be free of analytes and interferences.

8.1.6 2mM AMMONIUM ACETATE/METHANOL:WATER (5:95) – To prepare, mix 2 ml of 1M AMMONIUM ACETATE,1 ml ACETIC ACID and 50 ml METHANOL into I Liter of REAGENT WATER.

8.1.7 ACETONITRILE – UPLC grade or equivalent, store at room temperature

8.1.8 TOLUENE – HPLC grade or equivalent.

8.1.9 ACETONE – pesticide grade or equivalent

8.1.10 AMMONIUM ACETATE – (Caledon Ultra LC/MS grade or equivalent

8.1.11 AMMONIUM HYDROXIDE (NH_3, CAS#: 1336-21-6) – High purity, demonstrated to be free of analytes and interferences.

8.1.12 METHANOLIC AMMONIUM HYDROXIDE (0.3%) - add ammonium hydroxide (1 mL, 30%) to methanol (99 mL), store at room temperature, replace after 1 month

8.1.13 METHANOLIC AMMONIUM HYDROXIDE (1%) - add ammonium hydroxide (3.3 mL, 30%) to methanol (97 mL), store at room temperature, replace after 1 month

8.1.14 METHANOLIC AMMONIUM HYDROXIDE (2%) - add ammonium hydroxide (6.6 mL, 30%) to methanol (93.4 mL), store at room temperature, replace after 1 month

8.1.15 METHANOLIC POTASSIUM HYDROXIDE (0.05 M) – add 3.3 g of potassium hydroxide to 1 L of methanol, store at room temperature, replace after 3 months

8.1.16 METHANOL WITH 4% WATER, 1% AMMONIUM HYDROXIDE AND 0.625% ACETIC ACID - add ammonium hydroxide (3.3 mL, 30%), reagent water (1.7 mL) and acetic acid (0.625 mL) to methanol (92 mL), store at room temperature, replace after 1 month. This solution is used to prepare the instrument blank and calibration standards (Section 8.3.2).

8.1.17 FORMIC ACID – (greater than 96% purity or equivalent).

8.1.18 FORMIC ACID (aqueous, 0.1 M) - dissolve formic acid (4.6 g) in reagent water (1 L), store at room temperature, replace after 2 years

8.1.19 FORMIC ACID (aqueous, 0.3 M) - dissolve formic acid (13.8 g) in reagent water (1 L), store at room temperature, replace after 2 years

8.1.20 FORMIC ACID (aqueous, 5% v/v) - mix 5 mL formic acid with 95 mL reagent water, store at room temperature, replace after 2 years

8.1.21 FORMIC ACID (methanolic 1:1, 0.1 M formic acid/methanol) - mix equal volumes of methanol and 0.1 M formic acid, store at room temperature, replace after 2 years

8.1.22 FORMIC ACID (aqueous, 50% v/v) - mix 50 mL formic acid with 50 mL reagent water, store at room temperature, replace after 2 years

8.1.23 POTASSIUM HYDROXIDE – certified ACS or equivalent

8.1.24 CARBON - – EnviCarb® 1-M-USP or equivalent, verified by lot number before use, store at room temperature. Loose carbon allows for better adsorption of interferent organics. Note: The single-laboratory validation laboratory achieved better performance with loose carbon than carbon cartridges. Loose carbon will be used for the multi-laboratory validation to set statistically based method criteria.

8.1.25 NITROGEN – Used for the following purposes: Nitrogen aids in aerosol generation of the ESI liquid spray and is used as collision gas in some MS/MS instruments. The nitrogen used should meet or exceed instrument

manufacturer's specifications. In addition, Nitrogen is used to concentrate sample extracts (Ultra High Purity or equivalent).

8.1.26 ARGON – Used as collision gas in some MS/MS instruments. Argon should meet or exceed instrument manufacturer's specifications. Nitrogen gas may be used as the collision gas provided sufficient sensitivity (product ion formation) is achieved.

8.2 REFERENCE MATRICES - Matrices in which PFAS and interfering compounds are not detected by this method. These matrices are to be used to prepare the batch QC samples.

8.2.1 Reagent water - purified water, Type I

8.2.2 Solid reference matrix Ottawa Sand or equivalent

8.2.3 Tissue Reference matrix – Cod loin or other animal tissue demonstrated to be PFAS free

8.3 STANDARD SOLUTIONS – When a compound purity is assayed to be 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. PFAS analyte and IS standards commercially purchased in glass ampoules are acceptable; however, all subsequent transfers or dilutions performed by the analyst must be prepared and stored in polypropylene containers and are stored at ≤4 °C. Standards for sample fortification generally should be prepared in the smallest volume that can be accurately measured to minimize the addition of excess organic solvent to aqueous samples.

8.3.1 Stock standards and diluted stock standards are stored at ≤4 °C. Prepare a spiking solution, containing the method analytes listed in Table 1, in methanol from prime stocks. The solution is used to prepare the calibration standards and to spike the known reference QC samples that are analyzed with every batch. Quantitative standards containing a mixture of branched and linear isomers must be used for method analytes if they are commercially available. Currently, these include PFOS, PFHxS, NEtFOSAA, and NMeFOSAA.

8.3.2 Calibration standard solutions – A series of calibration solutions containing the target analytes and the Labeled extracted internal standards (EIS) and non-extracted internal standards (NIS) is used to establish the initial calibration of the analytical instrument. Table 4 represents the concentrations of the native, EIS and NIS analytes of the calibration curve. Calibration standard solutions are made using the solution described in section 8.1.16.

8.3.3 ISOTOPE DILUTION EXTRACTED INTERNAL STANDARD (EIS) – Isotopically labelled analogs of the target analytes to be used for the quantification of target analytes. EIS stock standard solutions are purchased in glass ampoules and are stored in accordance with the manufacturer's recommendations. The EIS stock solution to be used for the fortification of samples and QC in accordance with the isotope dilution procedure. Table 2 represents the EIS concentrations and nominal sample amounts added to each field sample and QC element.

8.3.4 ISOTOPE DILUTION NON-EXTRACTED INTERNAL STANDARDS (NIS) – Isotopically labelled analogs to be added post extraction for the measurement of EIS extraction efficiency and is added to the final volume of all extractions. Table 3 represents the EIS concentrations and nominal sample amounts added to each field sample and QC element.

9. Quality Control

9.1 Method Blank

9.1.1 A Method Blank (MB) is required with each extraction batch to confirm that potential background contaminants are not interfering with the identification or quantitation of method analytes. An aliquot of reagent water that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents and standards. Prep and analyze a MB for every 20 samples. If the MB produces a peak within the retention time window of any analyte that would prevent the determination of that analyte, determine the source of contamination, and eliminate the interference before processing samples. Background contamination must be reduced to an acceptable level before proceeding. Background from method analytes or other contaminants that interfere with the measurement of method analytes must be below the RL. If the method analytes are detected in the MB at concentrations equal to or greater than this level, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch.

9.2 Laboratory Control Sample (LCS)

9.2.1 Low Level LCS or OPR (Ongoing Precision Recovery) sample is required with each extraction batch. A LLCS or OPR samples is a method blank spiked with known quantities of analytes. The fortified concentration of the LCS is spiked at 2X the LOQ. Default limits of 70-130% of the true value may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. Calculate the percent recovery (%*R*) for each analyte using the equation:

9.2.2 An LCS or OPR (Ongoing Precision Recovery) sample is required with each extraction batch. A LCS or OPR samples is a method blank spiked with known quantities of analytes. The fortified concentration of the LCS is spiked at the midpoint of the calibration curve. Default limits of 70-130% of the true value may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. Calculate the percent recovery (%*R*) for each analyte using the equation:

$$\%R = \frac{A \times 100}{B}$$

Where:

A = measured concentration in the fortified sample
B =fortification concentration.

9.1.1 Where applicable, in the absence of additional sample volume required to perform matrix specific QC, LCSD's are to be extracted and analyzed. The concentration and analyte recovery criteria for the LCSD must be the same as the batch LCS The RSD's must fall within ≤30% of the true value for medium and high-level replicates, and ≤50% for low level replicates. Calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation:

$$RPD = \frac{|LCS - LCSD|}{(LCS + LCSD) / 2} \times 100$$

9.1.2 If the LCS and or LCSD results do not meet these criteria for method analytes, then all data for the problem analyte(s) must be considered invalid for all samples in the extraction batch.

9.3 Non-extracted Internal Standard Area (NIS)

Each time an initial calibration is performed, use the data from all the initial calibration standards used to meet the linearity test in Section 10.3.3.3 to calculate the mean area response for each of the NIS compounds, using the equation below.

$$\text{Mean Area}_{NISi} = \sum AREA_{NISi} / n$$

where:

AreaNISi = Area counts for the ith NIS, where i ranges from 1 to 7, for the seven NIS compounds listed in Table 1
n = The number of ICAL standards (the default value is n = 6). If a different number of standards is used for the ICAL, for example, to increase the calibration range or by dropping a point at either end of the range to meet the linearity criterion, change 6 to match the actual number of standards used)

Record the mean areas for each NIS for use in evaluating results for sample analyses. There is no acceptance criterion associated with the mean NIS area data.

9.4 Extracted Internal Standards (EIS)

9.4.1 The EIS standard is fortified into all samples, CCVs, MBs, LCSs, MSs, MSDs, FD, and FRB prior to extraction. It is also added to the CAL standards. The EIS is a means of assessing method performance from extraction to final chromatographic measurement. Calculate the recovery (%R) for the EIS using the following equation:

$$\%R = (A / B) \times 100$$

Where:
A = calculated EIS concentration for the QC or Field Sample
B = fortified concentration of the EIS.

9.4.2 Default limits of 50-150% may be used for analytes until sufficient replicates have been analyzed to generate proper control limits. A low or high percent recovery for a sample, blank, or CCV does not require discarding the analytical data but it may indicate a potential problem with future analytical data. When EIS recovery from a sample, blank, or CCV are outside control limits, check 1) calculations to locate possible errors, 2) standard solutions for degradation, 3) contamination, and 4) instrument performance. For CCVs and QC elements spiked with all target analytes, if the recovery of the corresponding target analytes meet the acceptance criteria for the EIS in question, the data can be used but all potential

biases in the recovery of the EIS must be documented in the sample report. If the associated target analytes do not meet the acceptance criteria, the data must be reanalyzed.

9.5 Matrix Spike (MS/MSD)

9.5.1 Analysis of an MS is prepared one per preparation batch (if required).

9.5.2 Aliquots of field samples that have been fortified with a known concentration of target compounds, prior to sample preparation and extraction, and analyzed to measure the effect of matrix interferences. The use of MS/MSD samples is generally not required in isotope dilution methods because the labeled compounds added to every sample provide more performance data than spiking a single sample in each preparation batch. Aliquots of field samples

9.5.3 Analyte recoveries may exhibit matrix bias. For samples fortified at or above their native concentration, recoveries should range between 50-150%. If the accuracy of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the LCS, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.6 Laboratory Duplicate

9.6.1 FIELD DUPLICATE OR LABORATORY FORTIFIED SAMPLE MATRIX DUPLICATE (FD or MSD) – Within each extraction batch (not to exceed 20 Field Samples), a minimum of one FD or MSD must be analyzed. Duplicates check the precision associated with sample collection, preservation, storage, and laboratory procedures. If method analytes are not routinely observed in Field Samples, an MSD should be analyzed rather than an FD.

9.6.2 Calculate the relative percent difference (*RPD*) for duplicate measurements (*FD1* and *FD2*) using the equation:

$$RPD = \frac{|FD1 - FD2|}{(FD1 + FD2) / 2} \times 100$$

9.6.3 RPDs for FDs should be ≤30%. Greater variability may be observed when FDs have analyte concentrations that are within a factor of 2 of the RL. At these concentrations, FDs should have RPDs that are ≤50%. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the CCV, the recovery is judged to be matrix biased. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.6.4 If an MSD is analyzed instead of a FD, calculate the relative percent difference (RPD) for duplicate MSs (MS and MSD) using the equation:

$$RPD = \frac{|MS - MSD|}{(MS + MSD) / 2} \times 100$$

9.6.5 RPDs for duplicate MSs should be ≤30% for samples fortified at or above their native concentration. Greater variability may be observed when MSs are fortified at analyte concentrations that are within a factor of 2 of the RL. MSs fortified at these concentrations should have RPDs that are ≤50% for samples fortified at or above their native concentration. If the RPD of any analyte falls outside the designated range, and the laboratory performance for that analyte is shown to be in control in the LCSD where applicable, the result is judged to be matrix biased. If no LCSD is present, the associated MS and MSD are to be re-analyzed to determine if any analytical has occurred. If the resulting RPDs are still outside control limits, the result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

9.7 Bile Salt Interference Check

9.7.1 The laboratory must analyze a TDCA standard after the initial calibration, prior to the analysis of tissue samples, to check for interferences caused by bile salts. If an interference is present, the chromatographic conditions must be modified to eliminate the interference from TDCA (e.g., changing the retention time of TDCA such that it falls outside the

9.8 Initial Calibration Verification (ICV)

9.8.1 After each ICAL, analyze a QCS sample from a source different from the source of the CAL standards. If a second vendor is not available, then a different lot of the standard should be used. The QCS should be prepared and analyzed just like a CCV. Acceptance criteria for the QCS are identical to the CCVs; the calculated amount for each analyte must be ± 30% of the expected value. If measured analyte concentrations are not of acceptable accuracy, check the entire analytical procedure to locate and correct the problem.

9.9 Instrument Sensitivity Check (ISC)

9.9.1 At the start of each 12-hour shift, analyze a standard at the LOQ. The signal-to-noise ratio of the ISC standard must be greater than or equal to 3:1. If the requirements cannot be met, the problem must be corrected before analyses can proceed

9.10 Continuing Calibration Verification (CCV)

9.10.1 CCV Standards must be analyzed at the beginning of each analysis batch, after every 10 Field Samples, and at the end of the analysis batch.

9.10.2 The recovery of native and isotopically labeled compounds for the CVs must be within 70 - 130%

9.10.3

9.11 Method-specific Quality Control Samples

9.11.1 Instrument Blank – During the analysis of a batch of samples, a solvent blank is analyzed after samples containing high level of target compounds (e.g., calibration, CV) to monitor carryover from the previous injection. The injection blank consists of the solution in

Section 8.1.16 fortified with the EIS and NIS for quantitation purposes.

9.12 Example Method Sequence

- INSTRUMENT BLANK
- INSTRUMENT SENSITIVITY CHECK
- CALIBRATION VERIFICATION STANDARD
- QUALITATIVE IDENTIFICATION STANDARDS
- TDCA STANDARD (only if analyzing tissues)
- INSTRUMENT BLANK
- METHOD BLANK
- LOW-LEVEL LCS/OPR
- OPR/LCS
- SAMPLE (10 or fewer)
- CALIBRATION VERIFICATION STANDARD
- INSTRUMENT BLANK
- SAMPLE (10 or fewer)
- CALIBRATION VERIFICATION STANDARD
- INSTRUMENT BLANK

10. Procedure

10.1 Equipment Set-up

10.1.1 This procedure may be performed manually or in an automated mode using a robotic or automatic sample preparation device. If an automated system is used to prepare samples, follow the manufacturer's operating instructions, but all extraction and elution steps must be the same as in the manual procedure. Extraction and/or elution steps may not be changed or omitted to accommodate the use of an automated system. If an automated system is used, the MBs should be rotated among the ports to ensure that all the valves and tubing meet the MB requirements.

10.1.2 Some of the PFAS's adsorb to surfaces, including polypropylene. Therefore, the aqueous sample bottles must be rinsed with the elution solvent whether extractions are performed manually or by automation. The bottle rinse is passed through the cartridge to elute the method analytes and is then collected.

10.1.3 The SPE cartridges and sample bottles described in this section are designed as single use items and should be discarded after use. They may not be refurbished for reuse in subsequent analyses.

10.1.4 All SPE apparatus, including manifolds, tubing and sample ports must be thoroughly rinsed following each use with 1% methanolic ammonium hydroxide, followed by Methanol and then DI water. Additionally, sample manifold ports and transfer tubing should be inspected regularly for signs of wear and/or discoloration. When such observations are made, the associated components should be replaced.

10.1.5 Prior to the start of any extraction, sample site information must be evaluated for any potentially high level PFAS concentrations or sample matrix irregularities that may impact the extraction process. If such samples are identified, aqueous samples may be pre-screened via direct aqueous injection prior to analysis to estimate the potential PFAS concentrations present.

10.1.6 To perform a direct aqueous injection (DAI) screen, the sample should be inverted several times to try and evenly disperse any organic matter present. A 1 ml aliquot (or less depending on the matrix) is to be taken from the parent sample, volume adjusted to 1 ml with reagent water if less than 1ml, fortified with EIS and NIS spiking solutions to match the concentrations of an extracted sample (typically 5 µl per 1 ml DAI), and then analyzed under the same analytical conditions as field samples.

10.2 Sample Preparation of Aqueous Samples

10.2.1 Samples are preserved, collected, and stored as presented in Section 6.

10.2.2 Determine sample volume. Weigh all samples to the nearest 1g. If visible sediment is present, centrifuge and decant into a new HDPE bottle and record the weight of the new container.

NOTE: Some of the PFAS's adsorb to surfaces, thus the sample volume may not be transferred to a graduated cylinder for volume measurement.

10.2.3 The MB, LCS and FRB may be prepared by measuring reagent water with a polypropylene graduated cylinder or filling an HDPE sample bottle to near the top.

10.2.4 Check that the pH is 6.5 ± 0.5. If necessary, adjust pH with 50% formic acid or ammonium hydroxide and 3% aqueous ammonium hydroxide. The extract is now ready for solid-phase extraction (SPE) and cleanup.

10.2.5 Add 20 µL of the EIS to each sample and QC, cap and invert to mix.

10.2.6 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS. Cap and invert each sample to mix.

10.3 Sample Prep and Extraction Protocol for Soils, Solids and Sediments.

10.3.1 Homogenize and weigh 5 grams of sample (measured to the nearest hundredth of a gram) into a 50 ml polypropylene centrifuge tube. For laboratory control blanks and spikes, 5 grams of clean sand is used.

10.3.1.1 For Biosolids and other complex matrices, a small aliquot may be required due to co-extracted matrix interferences.

10.3.1.2 For batch QC samples using 5 g of reference solid, add 2.5 g of reagent water. The addition of reagent water to the sand provides a matrix closer in composition to real-world samples.

10.3.2 Add 20 µL of the EIS to each sample and QC.

10.3.3 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS. Cap and invert each sample to mix.

10.3.4 Vortex the samples to evenly disperse the spiking solutions and allow to equilibrate for 30 minutes.

10.3.5 To all samples, add 10 ml of 0.3% methanolic ammonium hydroxide, cap, vortex for 25 seconds.

10.3.6 Following mixing, shake each sample for 30 minutes on a shaker table.

10.3.7 Centrifuge each sample at 2800RPM for 10 minutes.

10.3.8 Remove the supernatant and transfer to a clean 50 ml polypropylene centrifuge tube.

10.3.9 Repeat steps 10.3.4 to 10.3.7, with 15 ml of 0.3% methanolic ammonium hydroxide, combining the supernatants.

10.3.10 Add 5ml of 0.3% methanolic ammonium hydroxide to the sample, vortex for 25 seconds and centrifuge each sample at 2800RPM for 10 minutes.

10.3.11 Remove the supernatant and transfer to the same 50 ml polypropylene centrifuge tube containing eluates from the previous cycles.

10.3.12 Add 10 mg of carbon to the combined extract, mix by occasional hand shaking for no more than five minutes and then centrifuge at 2800 rpm for 10 minutes. Immediately decant the extract into a 50 ml polypropylene centrifuge tube.

10.3.13 Dilute to approximately 35 mL with reagent water. Samples containing more than 50% water may yield extracts that are greater than 35 mL in volume; therefore, do not add water to these. Determine the water content in the sample as follows (percent moisture is determined from the % solids):

Water Content in Sample = (Sample Weight * Percent moisture) / 100

10.3.14 Concentrate each extract at approximately 55 ºC with a gentle N2 flow to a final volume that is based on the water content of the sample (see table below). Allow extracts to concentrate for 10 minutes, then mix (by vortex if the volume is < 20. Continue concentrating and mixing every 5 minutes until the extract has been reduced to the required volume as specified in the table below. If the extract volume appears to stop dropping, the concentration must be stopped and the volume at which it was stopped recorded.

Water Content in Sample	Concentrated Final Volume
< 5 grams	15 ml
5-8 grams	15-20 ml
8-9 grams	20-22.5 ml
9-10 grams	22.5-25 ml

10.3.15 Add 40 - 50 mL of reagent water to the extract and vortex. Check that the pH is 6.5 ±0.5 and adjust as necessary with 50% formic acid or 30% ammonium

hydroxide, or with 5% formic acid and 3% aqueous ammonium hydroxide. The extracts are ready for SPE and cleanup.

10.4 Sample Prep and Extraction Protocol for Tissues.

10.4.1 Homogenize and weigh 2 grams of sample (measured to the nearest hundredth of a gram) into a 50 ml polypropylene centrifuge tube. For laboratory control blanks and spikes, 2 grams of clean tissue is used.

10.4.2 Add 20 µL of the EIS PDS to each sample and QC.

10.4.3 If the sample is an LCS, LCSD, MS, or MSD, add the necessary amount of analyte PDS. Cap and invert each sample to mix.

10.4.4 Add 10 mL of 0.05M KOH in methanol to each sample. Vortex to disperse the tissue then place tubes on a mixing table to extract for at 16 hours. Centrifuge at 2800 rpm for 10 minutes and collect the supernatant in a 50-mL polypropylene centrifuge tube.

10.4.5 Add 10 mL of acetonitrile to remaining tissue in the 50-mL centrifuge tube, vortex to mix and disperse the tissue. Sonicate for 30 minutes. Centrifuge at 2800 rpm for 10 minutes and collect the supernatant, adding it to the 50-mL centrifuge tube containing the initial extract.

10.4.6 Add 5 mL of 0.05M KOH in methanol to the remaining sample in each centrifuge tube. Vortex to disperse the tissue and hand mix briefly. Centrifuge at 2800 rpm for 10 minutes and collect the supernatant, adding it to the 50-mL centrifuge tube containing the first two extracts.

10.4.7 Add 10 mg of carbon to the combined extract, mix by occasional hand shaking over a period of no more than five minutes and then centrifuge at 2800 rpm for 10 minutes. Immediately decant the extract into a 50-mL centrifuge tube.

10.4.8 Add 1 mL of reagent water to each tube and concentrate each extract at approximately 55 ºC with a gentle N2 flow to a final volume of 2.5 ml.

10.4.9 Add reagent water to each evaporation/concentrator tube to dilute the extracts to 50 mL. Check that the pH = 6.5 ± 0.5 and adjust as needed with 50% formic acid, or ammonium hydroxide or with 5% formic acid and 3% aqueous ammonium hydroxide. The extracts are ready for SPE and cleanup.

10.5 SPE Extract: All matrices

10.5.1 Pack clean silanized glass wool to half the height of the WAX SPE cartridge barrel.

10.5.2 Pre-condition the cartridges by washing them with 3 X 5 mL of 1% methanolic ammonium hydroxide, discarding the wash volumes.

10.5.3 Rinse the cartridge with 5 mL of 0.3M formic acid, allowing the cartridge to drain using gravity only, discarding the rinse volume. Do not allow the cartridge to go dry

10.5.4 Adjust the vacuum so that the approximate flow rate is ~5 mL/min and load the sample across the cartridge. Do not allow the cartridge to go dry before all the sample has passed through.

10.5.5 Once all the sample has passed across the cartridge, rinse the walls of the reservoir with 2 X 5 mL reagent water, loading the rinse across the cartridge.

10.5.6 Rinse the walls of the reservoir with 5 mL of 1:1 0.1M formic acid/methanol and pass the rinse through the cartridge using vacuum. Dry the cartridge by pulling air through for 15 seconds.

10.5.7 Rinse the inside of the sample bottle with 5 mL of 1% methanolic ammonium hydroxide. Use vacuum to pull the elution solvent through the cartridge and into the collection tubes. When the cartridge bed and glass wool are submerged, stop the cartridge flow by closing the valve, keeping the sorbent bed and wool submerged.

10.5.8 Let the wetted sorbent bed and wool soak for 1 minute.

10.5.9 Open the cartridge valve and collect the eluate into a 15 ml polypropylene collection tube.

10.5.10 Add 25 µL of concentrated acetic acid to each sample eluted in the collection tubes and vortex to mix.

10.5.11 Add 10 mg of carbon to each sample and batch QC extract, using a 10-mg scoop. Handshake occasionally for no more than 5 minutes. It is important to minimize the time the sample extract is in contact with the carbon. Immediately vortex (30 seconds) and centrifuge at 2800 rpm for 10 minutes.

10.5.12 Add NIS solution to a clean collection tube. Place a syringe filter (25-mm filter, 0.2-µm nylon membrane) on a 5-mL polypropylene syringe. Take the plunger out and carefully decant the sample supernatant into the syringe barrel. Replace the plunger and filter the entire extract into the new collection tube containing the NIS.

10.5.13 Vortex to mix and transfer a portion of the extract into a .7-mL polypropylene LC vial for LC-MS/MS analysis. Cap the collection tube containing the remaining extract and store at 4 °C

10.6 Sample Volume Determination

10.6.1 If using weight to determine volume, weigh the empty bottle to the nearest 1 g and determine the sample weight by subtraction of the empty bottle weight from the original sample weight. Assume a sample density of 1.0 g/mL. In either case, the sample volume will be used in the final calculations of the analyte concentration.

10.7 Initial Calibration - Demonstration and documentation of acceptable initial calibration is required before any samples are analyzed. After the initial calibration is successful, a CCV is required at the beginning and end of each period in which analyses are performed, and after every tenth Field Sample.

10.7.1 ESI-MS/MS TUNE

10.7.1.1 Calibrate the mass scale of the MS with the calibration compounds and procedures prescribed by the manufacturer.

10.7.1.2 Optimize the [M-H]- or [M-CO_2]- for each method analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (0.4 mL/min). This tune can be done on a mix of the method analytes. The MS parameters (voltages, temperatures, gas flows, etc.) are varied until optimal analyte responses are determined.

The method analytes may have different optima requiring some compromise between the optima.

The Mass spec conditions found in Table 7 show the Sciex Triple Quad 5500+ operation conditions used in this method.

10.7.1.3 Optimize the product ion for each analyte by infusing approximately 0.5-1.0 µg/mL of each analyte (prepared in the initial mobile phase conditions) directly into the MS at the chosen LC mobile phase flow rate (approximately 0.4 mL/min). This tune can be done on a mix of the method analytes. The MS/MS parameters (collision gas pressure, collision energy, etc.) are varied until optimal analyte responses are determined. Typically, the carboxylic acids have very similar MS/MS conditions, and the sulfonic acids have similar MS/MS conditions.

The conditions found on table 5 are representative of expected tune optimizations for each analyte. If conditions other the ones close to the values provided in table 5 are achieved, the process should be re-performed and/or instrument maintenance performed to resolve the problem.

10.7.2 Establish LC operating parameters that optimize resolution and peak shape. Modifying the standard or extract composition to more aqueous content to prevent poor shape is not permitted.

Table 6 represents the operation conditions of a Sciex Exion LC system when running this method.

10.7.3 Inject 2µl of a mid-level CAL standard under LC/MS conditions to obtain the retention times of each method analyte. Divide the chromatogram into retention time windows each of which contains one or more chromatographic peaks. During MS/MS analysis, fragment a small number of selected precursor ions ([M-H]-) for the analytes in each window and choose the most abundant product ion. For maximum sensitivity, small mass windows of ±0.5 daltons around the product ion mass were used for quantitation.

10.7.4 Inject a mid-level CAL standard under optimized LC/MS/MS conditions to ensure that each method analyte is observed in its MS/MS window and that there are at least 10 scans across the peak for optimum precision.

NOTE: PFHxS, PFOS, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 7 due to chromatographic resolution of the linear and branched isomers of these compounds. Most PFAS's are produced by two different processes. One process gives rise to linear PFAS's only while the other process produces both linear and branched isomers. Thus, both branched and linear PFAS's can potentially be found in the environment. For the aforementioned compounds that give rise to more than one peak, all the chromatographic peaks observed in the standard must be integrated and the areas totaled. Chromatographic peaks in a sample must be integrated in the same way as the CAL standard.

10.7.5 Prepare a set of CAL standards as outlined in table 5. The lowest concentration CAL standard must be at or below the LOQ.

10.7.6 The LC/MS/MS system is calibrated using the isotope dilution technique. Target analytes are quantitated against their isotopically labeled analog (Extracted Internal Standard) where commercially available. If a labeled analog is not

commercially available, the extracted internal standard with the closest retention time and /or closest chemical similarity is to be used. Use the LC/MS/MS data system software to generate a linear regression or quadratic calibration curve for each of the analytes. This curve must always be forced through zero and may be concentration weighted, if necessary. Forcing zero allows for a better estimate of the background levels of method analytes. A minimum of 5 levels are required for a linear calibration model and a minimum of 6 levels are required for a quadratic calibration model.

10.7.7 **CALIBRATION ACCEPTANCE CRITERIA** – A linear fit is acceptable if the calculated RSD or RSE for each target analyte is ≤20%. If linear or Quadratic regressions are used, coefficient of determination (r^2) values must be greater than 0.99. When quantitated using the initial calibration curve, each calibration point at or above the LOQ for each analyte must calculate to be within 70-130% of its true value. The calculate value of each EIS analyte must be within 50-150% of its true value. If these criteria cannot be met, corrective action is taken to reanalyze the CAL standards, restrict the range of calibration.

10.7.8 **Bile salts interference check -** The laboratory must analyze a TDCA standard after the initial calibration, prior to the analysis of tissue samples, to check for interferences caused by bile salts. If an interference is present, the chromatographic conditions must be modified to eliminate the interference from TDCA (e.g., changing the retention time of TDCA such that it falls outside the retention window for PFOS by at least one minute), and the initial calibration repeated.

10.8 CONTINUING CALIBRATION CHECK (CCV) – Minimum daily calibration verification is as follows. Verify the initial calibration at the beginning and end of each group of analyses, and after every tenth sample during analyses. In this context, a “sample” is considered to be a Field Sample. MBs, CCVs, LCSs, MSs, FDs FRBs and MSDs are not counted as samples. The beginning CCV of each analysis batch must be at or below the RL in order to verify instrument sensitivity prior to any analyses. If standards have been prepared such that all low CAL points are not in the same CAL solution, it may be necessary to analyze two CAL standards to meet this requirement. Alternatively, the analyte concentrations in the analyte PDS may be customized to meet these criteria. Subsequent CCVs should alternate between a medium and Low concentration CAL standard.

10.8.1 Inject an aliquot of the appropriate concentration CAL standard and analyze with the same conditions used during the initial calibration.

10.8.2 Calculate the concentration of each analyte and EIS in the CCV. The calculated amount for each native and EIS analyte for medium level CCVs must be within ± 30% of the true. If these conditions do not exist, then all data for the problem analyte must be considered invalid, and remedial action should be taken which may require recalibration. Any Field or QC Samples that have been analyzed since the last acceptable calibration verification should be reanalyzed after adequate calibration has been restored, with the following exception. If the CCV fails because the calculated concentration is greater than 130% for a particular method analyte, and Field Sample extracts show no detection for that method analyte, non-detects may be reported without re-analysis.

10.8.3 REMEDIAL ACTION – Failure to meet CCV QC performance criteria may require remedial action. Major maintenance, such as cleaning the electrospray probe, atmospheric pressure ionization source, cleaning the mass analyzer, replacing the LC column, etc., requires recalibration and verification of sensitivity by analyzing a CCV at or below the LOQ.

10.9 EXTRACT ANALYSIS

10.9.1 The same operating conditions used for the initial calibration and summarized in Tables 6 and 7 are to be used.

10.9.2 Prior to analysis of sample extracts, the Instrument mass calibration verification must be performed using standards whose mass range brackets the masses of interest and performed in the negative ion mode. The mass calibration is verified if the calculated mass is within ± .2 daltons of the specified mass.

10.9.3 Establish an appropriate retention time window for each analyte. This should be based on measurements of actual retention time variation for each method analyte in CAL standard solutions analyzed on the LC over the course of time. A value of plus or minus three times the standard deviation of the retention time obtained for each method analyte while establishing the initial calibration can be used to calculate a suggested window size. However, the experience of the analyst should weigh heavily on the determination of the appropriate retention window size.

10.9.4 Calibrate the system by either the analysis of a calibration curve or by confirming the initial calibration is still valid by analyzing a CCV.

10.9.5 Begin analyzing Field Samples, including QC samples, at their appropriate frequency by injecting the same size aliquots under the same conditions used to analyze the CAL standards.

10.9.6 For concentrations at or above the method LOQ, the total (branched and linear isomer) quantification ion response to the total (branched and linear isomer) confirmation ion response ratio must fall within ± 50% of the ratio observed in the midpoint initial calibration standard.

10.9.7 At the conclusion of data acquisition, use the same software that was used in the calibration procedure to identify peaks of interest in predetermined retention time windows. Use the data system software to examine the ion abundances of the peaks in the chromatogram. Identify an analyte by comparison of its retention time with that of the corresponding method analyte peak in a reference standard.

10.9.8 The analyst must not extrapolate beyond the established calibration range. If an analyte peak area exceeds the range of the initial calibration curve, the sample should be re-extracted with a reduced sample volume in order to bring the out of range target analytes into the calibration range. If a smaller sample size would not be representative of the entire sample, the following options are recommended. Re-extract an additional aliquot of sufficient size to ensure that it is representative of the entire sample. Spike it with a higher concentration of internal standard. Prior to LC/MS analysis, dilute the sample so that it has a concentration of internal standard equivalent to that present in the calibration standard. Then, analyze the diluted extract.3

10.9.9 In instances where re-extraction is not an option, dilute a subsample of the sample extract with 0.1% acetic acid by a factor no greater than 10x adjust the amount of the NIS in the diluted extract, and analyze the diluted extract. If the

responses for each EIS in the diluted extract meet the S/N and retention time, and the EIS recoveries from the analysis of the diluted extract are greater than 5%, then the compounds associated with those EISs may be quantified using isotope dilution. Use the EIS recoveries from the original analysis to select the dilution factor, with the objective of keeping the EIS recoveries in the dilution above that 5% lower limit. If the adjusted EIS recoveries are below 5%, the dilution is assumed invalid. If the adjusted EIS recoveries are greater than 5%, adjust the compound concentrations, detection limits, and minimum levels to account for the dilution.

11. Data Evaluation, Calculations and Reporting

11.1 Complete chromatographic resolution is not necessary for accurate and precise measurements of analyte concentrations using MS/MS. In validating this method, concentrations were calculated by measuring the product ions listed in Table 9.

11.2 Calculate analyte concentrations using the multipoint calibration established in Section 10.9. Do not use daily calibration verification data to quantitate analytes in samples. Adjust final analyte concentrations to reflect the actual sample volume determined in Section 10.8

C_{ex} = (Area of target analyte * Concentration of Labeled analog) / (area of labeled analog * CF)

C_s = (C_{ex} / sample volume in ml) * 1000

C_{ex} = The concentration of the analyte in the extract
CF = calibration factor from calibration.

11.3 Prior to reporting the data, the chromatogram should be reviewed for any incorrect peak identification or poor integration.

11.4 PFHxS, PFOS, PFOA, NMeFOSAA, and NEtFOSAA have multiple chromatographic peaks using the LC conditions in Table 7 due to the linear and branch isomers of these compounds (Sect. 10.10.4.). The areas of all the linear and branched isomer peaks observed in the CAL standards for each of these analytes must be summed and the concentrations reported as a total for each of these analytes.

11.5 Calculations must utilize all available digits of precision, but final reported concentrations should be rounded to an appropriate number of significant figures (one digit of uncertainty), typically two, and not more than three significant figures.

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

12.1 Section 9.0 outlines sample batch QC acceptance criteria. If non-compliant organic compound results are to be reported, the Organic Section Head and/or the Laboratory Director, and the Operations Manager must approve the reporting of these results. The laboratory Project Manager shall be notified and may choose to relay the non-compliance to the client, for approval, or other corrective action, such as re-sampling and re-analysis. The analyst, Data Reviewer, or Department Supervisor performing the secondary review initiates the project narrative, and the narrative must clearly document the non-compliance and provide a reason for acceptance of these results.

12.2 All results for the organic compounds of interest are reportable without qualification if extraction and analytical holding times are met, preservation requirements (including cooler temperatures) are met, all QC criteria are met, and matrix interference is not suspected during extraction or analysis of the samples. If any of the below QC parameters are not met, all associated samples must be evaluated for re-extraction and/or re-analysis.

13. Method Performance

13.1 Detection Limit Study (DL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

13.1.1 The laboratory follows the procedure to determine the DL, LOD, and/or LOQ as outlined in Alpha SOP ID 1732. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

13.2.1 Refer to Alpha SOP ID 1739 for further information regarding IDC/DOC Generation.

13.2.2 The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

14.1 Refer to Alpha's Chemical Hygiene Plan and Hazardous Waste Management and Disposal SOP for further pollution prevention and waste management information.

14.2 This method utilizes SPE to extract analytes from water. It requires the use of very small volumes of organic solvent and very small quantities of pure analytes, thereby minimizing the potential hazards to both the analyst and the environment as compared to the use of large volumes of organic solvents in conventional liquid-liquid extractions.

14.3 The analytical procedures described in this method generate relatively small amounts of waste since only small amounts of reagents and solvents are used. The matrices of concern are finished drinking water or source water. However, laboratory waste management practices must be conducted consistent with all applicable rules and regulations, and that laboratories protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Also, compliance is required with any sewage discharge permits and regulations, particularly the hazardous waste identification rules and land disposal restrictions.

15. Referenced Documents

Chemical Hygiene Plan – ID 2124

SOP ID 1732 Detection Limit (DL), Limit of Detection (LOD) & Limit of Quantitation (LOQ) SOP

SOP ID 1739 Demonstration of Capability (DOC) Generation SOP

SOP ID 1728 Hazardous Waste Management and Disposal SOP

16. Attachments

Table 1: Names, Abbreviations, and CAS Registry Numbers for Target PFAS, Extracted Internal Standards and Non-extracted Internal Standards

Parameter	Acronym	CAS
PER- and POLYFLUOROALKYLETHER CARBOXYLIC ACIDS (PFECAs)		
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid	HFPO-DA	13252-13-6
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
PERFLUOROALKYLCARBOXILIC ACIDS (PFCAs)		

Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluoorotetradecanoic acid	PFTeDA	376-06-7
PERFLUOROALKYL SULFONIC ACIDS (PFASs)		
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanesulfonic acid	PFNS	68259-12-1

Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorododecanesulfonic acid	PFDoS	79780-39-5
CHLORO-PERFLUOROALKYLSULFONATE		
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
FLUOROTELOMER CARBOXYLIC ACIDS		
3-Perfluoropropyl propanoic acid	3:3FTCA	356-02-5
2H,2H,3H,3H-Perfluorooctanoic acid	5:3FTCA	914637-49-3
Perfluoroheptyl propanoic acid	7:3FTCA	812-70-4
PERFLUOROOCTANESULFONAMIDES		
Perfluorooctanesulfonamide	PFOSA	754-91-6
N-methylperfluoro-1-octanesulfonamide	NMeFOSA	31506-32-8
N-ethylperfluoro-1-octanesulfonamide	NEtFOSA	4151-50-2
PERFLUOROCTANE SULFONAMIDE ETHANOLS		
N-Methyl perfluorooctanesulfonamidoethanol	NMeFOSE	24448-09-7
N-ethyl perfluorooctanesulfonamidoethanol	NEtFOSE	1691-99-2
TELOMER SULFONIC ACIDS		

1H,1H,2H,2H-perfluorohexanesulfonic acid (4:2)	4:2FTS	757124-72-4
1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	6:2FTS	27619-97-2
1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	8:2FTS	39108-34-4
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS		
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
PERFLUOROETHER AND POLYETHER CARBOXYLIC ACIDS		
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-7
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6

Table 2: Stock and Nominal Extracted Internal Standard Concentrations

Isotope Labeled Standard	Conc. of EIS Stock (ng/mL)	Nominal amount of EIS added to extracts (ng)
M4PFBA	2000	40
M5PFPeA	1000	20
M5PFHxA	500	10
M4PFHpA	500	10
M8PFOA	500	10
M9PFNA	250	5
M6PFDA	250	5
M7PFUdA	250	5
MPFDoA	250	5
M2PFTeDA	250	5
M3PFBS	466	9.32
M3PFHxS	474	9.48
M8PFOS	479	9.58
M2-4:2FTS	938	18.8

Isotope Labeled Standard	Conc. of EIS Stock (ng/mL)	Nominal amount of EIS added to extracts (ng)
M2-6:2FTS	951	19
M2-8:2FTS	960	19.2
M8FOSA	500	10
d3-N-MeFOSA	500	10
d5-N-EtFOSA	500	10
d3-N-MeFOSAA	1000	20
d5-N-EtFOSAA	1000	20
d7-N-MeFOSE	5000	100
d9-N-EtFOSE	5000	100
M3HFPO-DA	2000	40

Table 3: Stock and Nominal Non-Extracted Internal Standard Concentrations

Isotope Labeled Standard	Conc. of EIS Stock (ng/mL)	Nominal amount of EIS added to extracts (ng)
M3PFBA	1000	40
M2PFHxA	500	10
M4PFOA	500	10
M5PFNA	250	5
M2PFDA	250	5
18O2PFHxS	474	9.48
M4PFOS	479	9.58

Table 4: Initial Calibration levels and Concentrations

Analyte	Cal A	Cal B (LOQ)	CAL C	Cal D	Cal E (CCV)	Cal F	Cal G	Cal H	Cal I
PFBA	.4	.8	2	5	10	20	50	250	500
PFPeA	.2	.4	1	2.5	5	10	25	125	250
PFHxA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFHpA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFOA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFNA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFDA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFUnA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFDoA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFTrDA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFTA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
PFBS	0.089	0.177	0.444	1.11	2.22	4.44	11.1	55.4	111
PFPeS	0.094	0.188	0.471	1.18	2.35	4.71	11.8	58.8	118

PFHxS	0.091	0.183	0.457	1.14	2.29	4.57	11.4	57.1	114
PFHpS	0.095	0.191	0.477	1.19	2.38	4.77	11.9	59.6	119
PFOS	0.093	0.186	0.464	1.16	2.32	4.64	11.6	58	116
PFNS	0.096	0.192	0.481	1.20	2.41	4.81	12	60.1	120
PFDS	0.097	0.193	0.483	1.21	2.41	4.83	12.1	60.3	121
PFDOS	0.097	0.194	0.485	1.21	2.43	4.85	12.1	60.6	121.
4:2FTS	0.375	0.75	1.88	4.69	9.38	18.8	46.9	234	469
6:2FTS	0.38	0.76	1.9	4.75	9.5	19	47.5	238	475
8:2FTS	0.384	0.768	1.92	4.8	9.6	19.2	48	240	480
PFOSA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
NMeFOSA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
NEtFOSA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
NMeFOSAA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
NEtFOSAA	.1	.2	.5	1.25	2.5	5	12.5	62.5	125
NMeFOSE	1	2	5	12.5	25	50	125	625	1250
NEtFOSE	1	2	5	12.5	25	50	125	625	1250
HFPO-DA	.4	.8	2	5	10	20	50	250	500
ADONA	0.378	0.756	1.89	4.73	9.45	18.9	47.3	236	473
9Cl-PFONS	0.374	0.748	1.87	4.68	9.35	18.7	46.8	234	468
11Cl-PFOUdS	0.378	0.756	1.89	4.73	9.45	18.9	47.3	236	473
PFMPA	.2	.4	1	2.5	5	10	25	125	250
PFMBA	.2	.4	1	2.5	5	10	25	125	250
PFEESA	0.178	0.356	0.89	2.23	4.45	8.9	22.3	111	223
NFDHA	.2	.4	1	2.5	5	10	25	125	250
3:3FTCA	.5	1	2.5	6.25	12.5	25	62.5	312	624
5:3FTCA	2.5	5	12.5	31.3	62.5	125	312	1560	3120
7:3FTCA	2.5	5	12.5	31.3	62.5	125	312	1560	3125
M4PFBA	10	10	10	10	10	10	10	10	10
M5PFPeA	5	5	5	5	5	5	5	5	5
M5PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
M4PFHpA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
M8PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
M9PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
M6PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
M7PFUdA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
MPFDoA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

M2PFTeDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
M3PFBS	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33
M3PFHxS	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
M8PFOS	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
M2-4:2FTS	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69
M2-6:2FTS	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
M2-8:2FTS	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
M8FOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
d3-N-MeFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
d5-N-EtFOSA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
d3-N-MeFOSAA	5	5	5	5	5	5	5	5	5
d5-N-EtFOSAA	5	5	5	5	5	5	5	5	5
d7-N-MeFOSE	25	25	25	25	25	25	25	25	25
d9-N-EtFOSE	25	25	25	25	25	25	25	25	25
M3HFPO-DA	10	10	10	10	10	10	10	10	10
M3PFBA	5	5	5	5	5	5	5	5	5
M2PFHxA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
M4PFOA	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
M5PFNA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
M2PFDA	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
18O2PFHxS	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
M4PFOS	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4

Table 5: Expected Mass Transitions and instrument conditions.

Q1	Q2	Analyte	DP Volts	CE Volts
213.032	169.022	PFBA	-50	-14
263.039	219.03	PFPeA	-55	-12
263.039	68.9	PFPeA_2	-55	-55
313.047	269.037	PFHxA	-45	-12
313.047	119	PFHxA_2	-45	-28
363.055	319.045	PFHpA	-60	-12
363.055	169.022	PFHpA_2	-60	-24
413.063	369.053	PFOA	-65	-14
413.063	169.022	PFOA_2	-65	-23
463.071	419.061	PFNA	-70	-14
463.071	219.03	PFNA_2	-70	-24

513.078	469.069	PFDA	-80	-16
513.078	219.03	PFDA_2	-80	-30
563.086	519.076	PFUnA	-85	-18
563.086	269.037	PFUnA_2	-85	-25
613.094	569.084	PFDoA	-85	-18
613.094	319.045	PFDoA_2	-85	-28
663.102	619.092	PFTrDA	-85	-20
663.102	169.022	PFTrDA_2	-85	-36
713.11	669.1	PFTA	-70	-22
713.11	169.022	PFTA_2	-70	-38
299.092	80.062	PFBS	-100	-65
299.092	99.061	PFBS_2	-100	-40
349.1	80.062	PFPeS	-100	-75
349.1	99.061	PFPeS_2	-100	-60
399.107	80.062	PFHxS	-120	-75
399.107	99.061	PFHxS_2	-120	-80
449.115	80.062	PFHpS	-140	-95
449.115	99.061	PFHpS_2	-140	-80
499.113	80.062	PFOS	-145	-108
499.113	99.061	PFOS_2	-145	-85
549.131	80.062	PFNS	-180	-100
549.131	99.061	PFNS_2	-180	-100
599.139	80.062	PFDS	-170	-110
599.138	99.061	PFDS_2	-170	-100
699.154	80.062	PFDoS	-160	-150
699.154	99.061	PFDoS_2	-160	-130
327.146	307.139	4:2FTS	-100	-28
327.146	81.07	4:2FTS_2	-100	-50
427.161	407.155	6:2FTS	-120	-33
427.161	81.07	6:2FTS_2	-120	-65
527.177	507.17	8:2FTS	-140	-39
527.177	81.07	8:2FTS_2	-140	-85
498.146	78.07	FOSA	-150	-90
498.146	478	FOSA_2	-150	-35
512.163	219.03	NMeFOSA	-130	-35
512.163	169.022	NMeFOSA_2	-130	-40
526.192	219.03	NEtFOSA	-140	-35
526.192	169.022	NEtFOSA_2	-140	-35
570.202	419.061	NMeFOSAA	-100	-28

570.202	483	NMeFOSAA_2	-100	-22
584.229	419.061	NEtFOSAA	-100	-28
584.229	526.192	NEtFOSAA_2	-100	-38
616.1	58.9	NMeFOSE	-90	-70
630	58.9	NEtFOSE	-80	-75
285.035	169.022	HFPO-DA	-60	-12
285.035	184.9	HFPO-DA_2	-60	-18
377.06	251.028	ADONA	-65	-18
377.06	84.8	ADONA_2	-65	-48
530.8	351.05	9Cl-PFONS	-130	-38
532.8	353	9Cl-PFONS_2	-130	-38
630.9	451.031	11Cl-PFOUdS	-145	-41
632.9	452.9	11Cl-PFOUdS_2	-145	-41
241.085	177.069	3:3FTCA	-60	-12
241.085	117	3:3FTCA_2	-60	-50
341.101	237.072	5:3FTCA	-70	-20
341.101	217	5:3FTCA_2	-70	-35
441.117	316.9	7:3FTCA	-85	-30
441.117	337.088	7:3FTCA_2	-85	-20
315.093	135.013	PFEESA	-100	-35
315.093	82.9	PFEESA_2	-100	-25
229.032	85.006	PFMPA	-40	-25
279.042	85.006	PFMBA	-45	-25
295.032	201	NFDHA	-30	-15
295.032	84.9	NFDHA_2	-30	-40
217.001	171.999	MPFBA	-50	-14
268.001	222.999	M5PFPeA	-55	-12
318.009	273.007	M5PFHxA	-45	-12
367.024	322.022	M4PFHpA	-60	-12
421.002	376	M8PFOA	-65	-14
472.002	427	M9PFNA	-70	-14
519.033	474.03	M6PFDA	-80	-16
570.033	525.031	M7-PFUdA	-85	-18
615.079	570.033	MPFDoA	-85	-18
715.094	670.092	M2PFTeDA	-70	-22
302.069	80.062	M3PFBS	-100	-65
402.084	80.062	M3PFHxS	-120	-74
507.062	80.062	M8PFOS	-145	-85
329.13	81.07	M2-4:2FTS	-100	-50

429.162	81.07	M2-6:2FTS	-120	-65
529.162	81.07	M2-8:2FTS	-140	-85
506.077	78.07	M8FOSA	-150	-90
515.183	219.03	d3-NMeFOSA	-130	-35
531.222	219.03	d5-NEtFOSA	-140	-35
573.22	419.061	d3-NMeFOSAA	-75	-28
589.259	419.061	d5-NEtFOSAA	-90	-28
623.2	58.9	d7-NMeFOSE	-100	-28
639.2	58.9	d9-NEtFOSE	-100	-28
287.02	169.022	M3HFPO-DA	-60	-12
216.009	171.999	M3PFBA	-50	-14
315.032	270.03	M2PFHxA	-45	-12
417.032	372.03	M4PFOA	-65	-14
468.032	423.03	M5PFNA	-70	-14
515.063	470.061	M2PFDA	-80	-16
403.107	84.062	18O2-PFHxS	-120	-74
503.093	80.062	M4PFOS	-145	-85

Table 6: LC Method Conditions

Time (min)	2 mM Ammonium Acetate (5:95 CH/H_2O)	100% Acetonitrile	Gradient Curve
Initial	100.0	0.0	0
.2	100.0	0.0	2
4	70	30	7
7	45	55	8
9	25	80	8
10	5	95	6
10.4	98	2	10
11.8	100	0	7
12	100	0	1
Waters Aquity UPLC ® BEHC_{18} 2.1 x 50 mm packed with 1.7 µm BEH C_{18} stationary phase Flow rate of 0.4 mL/min 2 µL injection			

Table 7: ESI-MS Method Conditions

ESI Conditions	
Polarity	Negative ion
Curtain Gas	30
Collision gas	9
Ion Spray Voltage	-4500
Desolvation gas temp.	500 ºC
Ion Source Gas 1	30
Ion Source Gas 2	50
Entrance Poitential	-10
Exic Cell Potential	-11

Table 8. Reporting limits by Matrix

Compound	Aqueous (ng/L)	Solid (ng/g)	Tissue (ng/g)
PFBA	6.4	0.8	2
PFPeA	3.2	0.4	1
PFHxA	1.6	0.2	0.5
PFHpA	1.6	0.2	0.5
PFOA	1.6	0.2	0.5
PFNA	1.6	0.2	0.5
PFDA	1.6	0.2	0.5
PFUnA	1.6	0.2	0.5
PFDoA	1.6	0.2	0.5
PFTrDA	1.6	0.2	0.5
PFTA	1.6	0.2	0.5
PFBS	1.6	0.2	0.5
PFPeS	1.6	0.2	0.5
PFHxS	1.6	0.2	0.5
PFHpS	1.6	0.2	0.5
PFOS	1.6	0.2	0.5
PFNS	1.6	0.2	0.5
PFDS	1.6	0.2	0.5
PFDoS	1.6	0.2	0.5
4:2FTS	6.4	0.8	2
6:2FTS	6.4	0.8	2
8:2FTS	6.4	0.8	2
FOSA	1.6	0.2	2
NMeFOSA	1.6	0.2	0.5

NEtFOSA	1.6	0.2	0.5
NMeFOSAA	1.6	0.2	0.5
NEtFOSAA	1.6	0.2	0.5
NMeFOSE	16	2	5
NEtFOSE	16	2	5
HFPO-DA	6.4	0.8	2
ADONA	6.4	0.8	2
9Cl-PFONS	6.4	0.8	2
11Cl-PFOUdS	6.4	0.8	2
3:3FTCA	8	1	2.5
5:3FTCA	40	5	12.5
7:3FTCA	40	5	12.5
PFEESA	3.2	0.4	1
PFMPA	3.2	0.4	1
PFMBA	3.2	0.4	1
NFDHA	3.2	0.4	1

ATTACHMENT F

ELAP Certifications

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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MR. JOHN TRIMBLE
ALPHA ANALYTICAL
320 FORBES BOULEVARD
MANSFIELD, MA 02048

NY Lab Id No: 11627

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates

Acetonitrile	EPA TO-15
Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15

Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15

Polychlorinated Biphenyls

PCBs and Aroclors	EPA TO-10A
	EPA TO-4A

Polynuclear Aromatics

Acenaphthene	EPA TO-13A
Acenaphthylene	EPA TO-13A
Anthracene	EPA TO-13A
Benzo(a)anthracene	EPA TO-13A
Benzo(a)pyrene	EPA TO-13A
Benzo(b)fluoranthene	EPA TO-13A
Benzo(g,h,i)perylene	EPA TO-13A
Benzo(k)fluoranthene	EPA TO-13A
Chrysene	EPA TO-13A
Dibenzo(a,h)anthracene	EPA TO-13A
Fluoranthene	EPA TO-13A
Fluorene	EPA TO-13A
Indeno(1,2,3-cd)pyrene	EPA TO-13A
Naphthalene	EPA TO-13A
	EPA TO-15
Phenanthrene	EPA TO-13A

Serial No.: 67090

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Polynuclear Aromatics

Pyrene	EPA TO-13A

Purgeable Aromatics

1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15
o-Xylene	EPA TO-15
Styrene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15

Purgeable Halocarbons

1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dibromo-3-chloropropane	EPA TO-15
1,2-Dibromoethane	EPA TO-15

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Purgeable Halocarbons

1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
3-Chloropropene (Allyl chloride)	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15
cis-1,3-Dichloropropene	EPA TO-15
Dibromochloromethane	EPA TO-15
Dichlorodifluoromethane	EPA TO-15
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl bromide	EPA TO-15
Vinyl chloride	EPA TO-15

Volatile Chlorinated Organics

Benzyl chloride	EPA TO-15

Volatile Organics

1,2-Dichlorotetrafluoroethane	EPA TO-15

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Volatile Organics

1,3-Butadiene	EPA TO-15
1,4-Dioxane	EPA TO-15
2,2,4-Trimethylpentane	EPA TO-15
2-Butanone (Methylethyl ketone)	EPA TO-15
4-Methyl-2-Pentanone	EPA TO-15
Acetaldehyde	EPA TO-15
Acetone	EPA TO-15
Acrolein (Propenal)	EPA TO-15
Carbon Disulfide	EPA TO-15
Cyclohexane	EPA TO-15
Hexane	EPA TO-15
Isopropanol	EPA TO-15
Methanol	EPA TO-15
Methyl tert-butyl ether	EPA TO-15
n-Heptane	EPA TO-15
tert-butyl alcohol	EPA TO-15
Vinyl acetate	EPA TO-15

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All approved analytes are listed below:

Metals I

Arsenic, Total	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	EPA 200.8 Rev. 5.4
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Antimony, Total	EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.8 Rev. 5.4
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Thallium, Total	EPA 200.8 Rev. 5.4

Serial No.: 67087

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ALPHA ANALYTICAL
320 FORBES BOULEVARD
MANSFIELD, MA 02048

NY Lab Id No: 11627

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All approved analytes are listed below:

Metals II

Vanadium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Metals III

Boron, Total	EPA 200.7 Rev. 4.4
Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4

Miscellaneous

1,4-Dioxane	EPA 522
2,3,7,8-Tetrachlorodibenzo-p-dioxin	EPA 1613B

Non-Metals

Calcium Hardness	EPA 200.7 Rev. 4.4

Perfluorinated Alkyl Acids

11CL-PF3OUDS	EPA 533
	EPA 537.1
4:2FTS	EPA 533
6:2FTS	EPA 533
8:2FTS	EPA 533
9CL-PF3ONS	EPA 533
	EPA 537.1
ADONA	EPA 533
	EPA 537.1
Hexafluoropropylene Oxide Dimer Acic	EPA 533
	EPA 537.1
NETFOSAA	EPA 537.1

Serial No.: 67087

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. JOHN TRIMBLE
ALPHA ANALYTICAL
320 FORBES BOULEVARD
MANSFIELD, MA 02048

NY Lab Id No: 11627

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Perfluorinated Alkyl Acids

NMEFOSAA	EPA 537.1
Nonafluoro-3,6-Dioxaheptanoic Acid	EPA 533
Perflourotridecanoic Acid (PFTRDA)	EPA 537.1
Perfluordecanoic Acid (PFDA)	EPA 533
	EPA 537.1
Perfluoro-3-Methoxypropanoic Acid	EPA 533
Perfluoro-4-Methoxybutanoic Acid	EPA 533
Perfluorobutanesulfonic Acid (PFBS)	EPA 533
	EPA 537.1
Perfluorobutanoic Acid (PFBA)	EPA 533
Perfluorododecanoic Acid (PFDOA)	EPA 533
	EPA 537.1
Perfluoroheptanesulfonic Acid (PFHPS	EPA 533
Perfluoroheptanoic Acid (PFHPA)	EPA 533
	EPA 537.1
Perfluorohexanesulfonic Acid (PFHXS	EPA 533
	EPA 537.1
Perfluorohexanoic Acid (PFHXA)	EPA 533
	EPA 537.1
Perfluorononanoic Acid (PFNA)	EPA 533
	EPA 537.1
Perfluorooctanesulfonic Acid (PFOS)	EPA 533
	EPA 537.1
Perfluorooctanoic Acid (PFOA)	EPA 533
	EPA 537.1
Perfluoropentanesulfonic Acid (PFPES	EPA 533
Perfluoropentanoic Acid (PFPEA)	EPA 533

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Perfluorinated Alkyl Acids

Perfluorotetradecanoic Acid (PFTA)	EPA 537.1
Perfluoroundecanoic Acid (PFUNA)	EPA 533
	EPA 537.1
PFEESA	EPA 533

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Amines

1,2-Diphenylhydrazine	EPA 8270D
	EPA 8270E
2-Nitroaniline	EPA 8270D
	EPA 8270E
3-Nitroaniline	EPA 8270D
	EPA 8270E
4-Chloroaniline	EPA 8270D
	EPA 8270E
4-Nitroaniline	EPA 8270D
	EPA 8270E
Aniline	EPA 8270D
	EPA 8270E
Carbazole	EPA 8270D
	EPA 8270E
Pyridine	EPA 8270D
	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 8270E
Benzidine	EPA 8270E

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Isodrin	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
PCNB	EPA 8270E
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,4,5-Tetrachlorobenzene	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270D
2-Chloronaphthalene	EPA 8270E
Hexachlorobenzene	EPA 8081B
	EPA 8270E
Hexachlorobutadiene	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270E

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Chlorinated Hydrocarbons

Hexachloroethane	EPA 8270E

Dioxins and Furans

1,2,3,4,6,7,8,9-Octachlorodibenzofura	EPA 8290A
	EPA 1613B
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-d	EPA 8290A
	EPA 1613B
1,2,3,4,6,7,8-Heptachlorodibenzofurar	EPA 8290A
	EPA 1613B
1,2,3,4,6,7,8-Heptachlorodibenzo-p-di	EPA 8290A
	EPA 1613B
1,2,3,4,7,8,9-Heptachlorodibenzofurar	EPA 8290A
	EPA 1613B
1,2,3,4,7,8-Hexachlorodibenzofuran	EPA 8290A
	EPA 1613B
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxi	EPA 8290A
	EPA 1613B
1,2,3,6,7,8-Hexachlorodibenzofuran	EPA 8290A
	EPA 1613B
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxi	EPA 8290A
	EPA 1613B
1,2,3,7,8,9-Hexachlorodibenzofuran	EPA 8290A
	EPA 1613B
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxi	EPA 8290A
	EPA 1613B
1,2,3,7,8-Pentachlorodibenzofuran	EPA 8290A
	EPA 1613B
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	EPA 8290A

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Dioxins and Furans

1,2,3,7,8-Pentachlorodibenzo-p-dioxin	EPA 1613B
2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A
	EPA 1613B
2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A
	EPA 1613B
2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A
	EPA 1613B
2,3,7,8-Tetrachlorodibenzo-p-dioxin	EPA 8290A
	EPA 1613B

Dissolved Gases

Ethane	RSK-175
Ethene (Ethylene)	RSK-175
Methane	RSK-175
Propane	RSK-175

Fuel Oxygenates

Ethanol	EPA 8015D
tert-amyl alcohol	EPA 8015D
tert-butyl alcohol	EPA 8015D

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270E

Low Level Polynuclear Aromatics

Acenaphthene Low Level	EPA 8270E SIM

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Low Level Polynuclear Aromatics

Acenaphthylene Low Level	EPA 8270E SIM
Anthracene Low Level	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270E SIM
Chrysene Low Level	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270E SIM
Fluorene Low Level	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270E SIM
Naphthalene Low Level	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270E SIM
Pyrene Low Level	EPA 8270E SIM

Metals I

Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B

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Metals I

Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Magnesium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

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Metals I

Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Strontium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B

Metals II

Aluminum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Antimony, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Arsenic, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B

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Metals II

Arsenic, Total	EPA 200.8, Rev. 5.4 (1994)
Beryllium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Mercury, Low Level	EPA 1631E
Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 7470A
Selenium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)

Metals III

Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Molybdenum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D

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Metals III

Molybdenum, Total	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Thallium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
	EPA 200.8, Rev. 5.4 (1994)
Tin, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
Titanium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D

Mineral

Hardness, Total	SM 2340B-2011

Miscellaneous

Boron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D
	EPA 6020B
Silica, Dissolved	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010D

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270D
	EPA 8270E
2,6-Dinitrotoluene	EPA 8270D
	EPA 8270E
Isophorone	EPA 8270D
	EPA 8270E

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Nitroaromatics and Isophorone

Nitrobenzene	EPA 8270D
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270E

Organophosphate Pesticides

Atrazine	EPA 8270E

Perfluorinated Alkyl Acids

11CL-PF3OUDS	EPA 1633 (Draft)
4:2FTS	EPA 1633 (Draft)
6:2FTS	EPA 1633 (Draft)
8:2FTS	EPA 1633 (Draft)
9CL-PF3ONS	EPA 1633 (Draft)
ADONA	EPA 1633 (Draft)
Hexafluoropropylene Oxide Dimer Acic	EPA 1633 (Draft)
NETFOSAA	EPA 1633 (Draft)
NMEFOSAA	EPA 1633 (Draft)
Nonafluoro-3,6-Dioxaheptanoic Acid	EPA 1633 (Draft)
Perflourotridecanoic Acid (PFTRDA)	EPA 1633 (Draft)
Perfluordecanoic Acid (PFDA)	EPA 1633 (Draft)
Perfluoro-3-Methoxypropanoic Acid	EPA 1633 (Draft)
Perfluoro-4-Methoxybutanoic Acid	EPA 1633 (Draft)
Perfluorobutanesulfonic Acid (PFBS)	EPA 1633 (Draft)
Perfluorobutanoic Acid (PFBA)	EPA 1633 (Draft)
Perfluorododecanoic Acid (PFDOA)	EPA 1633 (Draft)

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Perfluorinated Alkyl Acids

Perfluoroheptanesulfonic Acid (PFHPS	EPA 1633 (Draft)
Perfluoroheptanoic Acid (PFHPA)	EPA 1633 (Draft)
Perfluorohexanesulfonic Acid (PFHXS	EPA 1633 (Draft)
Perfluorohexanoic Acid (PFHXA)	EPA 1633 (Draft)
Perfluorononanoic Acid (PFNA)	EPA 1633 (Draft)
Perfluorooctanesulfonic Acid (PFOS)	EPA 1633 (Draft)
Perfluorooctanoic Acid (PFOA)	EPA 1633 (Draft)
Perfluoropentanesulfonic Acid (PFPES	EPA 1633 (Draft)
Perfluoropentanoic Acid (PFPEA)	EPA 1633 (Draft)
Perfluorotetradecanoic Acid (PFTA)	EPA 1633 (Draft)
Perfluoroundecanoic Acid (PFUNA)	EPA 1633 (Draft)
PFEESA	EPA 1633 (Draft)

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D

Phthalate Esters

Benzyl butyl phthalate	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 8270E
Diethyl phthalate	EPA 8270E
Dimethyl phthalate	EPA 8270E
Di-n-butyl phthalate	EPA 8270E
Di-n-octyl phthalate	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. JOHN TRIMBLE
ALPHA ANALYTICAL
320 FORBES BOULEVARD
MANSFIELD, MA 02048

NY Lab Id No: 11627

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
PCB 1	EPA 1668A
	EPA 1668C
PCB 10	EPA 1668A
	EPA 1668C
PCB 100	EPA 1668A
	EPA 1668C
PCB 101	EPA 1668A
	EPA 1668C
PCB 102	EPA 1668A
	EPA 1668C
PCB 103	EPA 1668A
	EPA 1668C
PCB 104	EPA 1668A
	EPA 1668C
PCB 105	EPA 1668A
	EPA 1668C
PCB 106	EPA 1668A
	EPA 1668C
PCB 107	EPA 1668A
	EPA 1668C
PCB 108	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 109	EPA 1668A
	EPA 1668C
PCB 11	EPA 1668A
	EPA 1668C
PCB 110	EPA 1668A
	EPA 1668C
PCB 111	EPA 1668A
	EPA 1668C
PCB 112	EPA 1668A
	EPA 1668C
PCB 113	EPA 1668A
	EPA 1668C
PCB 114	EPA 1668A
	EPA 1668C
PCB 115	EPA 1668A
	EPA 1668C
PCB 116	EPA 1668A
	EPA 1668C
PCB 117	EPA 1668A
	EPA 1668C
PCB 118	EPA 1668A
	EPA 1668C
PCB 119	EPA 1668A
	EPA 1668C
PCB 12	EPA 1668A
	EPA 1668C
PCB 120	EPA 1668A

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Polychlorinated Biphenyls

PCB 120	EPA 1668C
PCB 121	EPA 1668A
	EPA 1668C
PCB 122	EPA 1668A
	EPA 1668C
PCB 123	EPA 1668A
	EPA 1668C
PCB 124	EPA 1668A
	EPA 1668C
PCB 125	EPA 1668A
	EPA 1668C
PCB 126	EPA 1668A
	EPA 1668C
PCB 127	EPA 1668A
	EPA 1668C
PCB 128	EPA 1668A
	EPA 1668C
PCB 129	EPA 1668A
	EPA 1668C
PCB 13	EPA 1668A
	EPA 1668C
PCB 130	EPA 1668A
	EPA 1668C
PCB 131	EPA 1668A
	EPA 1668C
PCB 132	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 133	EPA 1668A
	EPA 1668C
PCB 134	EPA 1668A
	EPA 1668C
PCB 135	EPA 1668A
	EPA 1668C
PCB 136	EPA 1668A
	EPA 1668C
PCB 137	EPA 1668A
	EPA 1668C
PCB 138	EPA 1668A
	EPA 1668C
PCB 139	EPA 1668A
	EPA 1668C
PCB 14	EPA 1668A
	EPA 1668C
PCB 140	EPA 1668A
	EPA 1668C
PCB 141	EPA 1668A
	EPA 1668C
PCB 142	EPA 1668A
	EPA 1668C
PCB 143	EPA 1668A
	EPA 1668C
PCB 144	EPA 1668A
	EPA 1668C
PCB 145	EPA 1668A

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Polychlorinated Biphenyls

PCB 145	EPA 1668C
PCB 146	EPA 1668A
	EPA 1668C
PCB 147	EPA 1668A
	EPA 1668C
PCB 148	EPA 1668A
	EPA 1668C
PCB 149	EPA 1668A
	EPA 1668C
PCB 15	EPA 1668A
	EPA 1668C
PCB 150	EPA 1668A
	EPA 1668C
PCB 151	EPA 1668A
	EPA 1668C
PCB 152	EPA 1668A
	EPA 1668C
PCB 153	EPA 1668A
	EPA 1668C
PCB 154	EPA 1668A
	EPA 1668C
PCB 155	EPA 1668A
	EPA 1668C
PCB 156	EPA 1668A
	EPA 1668C
PCB 157	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 158	EPA 1668A
	EPA 1668C
PCB 159	EPA 1668A
	EPA 1668C
PCB 16	EPA 1668A
	EPA 1668C
PCB 160	EPA 1668A
	EPA 1668C
PCB 161	EPA 1668A
	EPA 1668C
PCB 162	EPA 1668A
	EPA 1668C
PCB 163	EPA 1668A
	EPA 1668C
PCB 164	EPA 1668A
	EPA 1668C
PCB 165	EPA 1668A
	EPA 1668C
PCB 166	EPA 1668A
	EPA 1668C
PCB 167	EPA 1668A
	EPA 1668C
PCB 168	EPA 1668A
	EPA 1668C
PCB 169	EPA 1668A
	EPA 1668C
PCB 17	EPA 1668A

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Polychlorinated Biphenyls

PCB 17	EPA 1668C
PCB 170	EPA 1668A
	EPA 1668C
PCB 171	EPA 1668A
	EPA 1668C
PCB 172	EPA 1668A
	EPA 1668C
PCB 173	EPA 1668A
	EPA 1668C
PCB 174	EPA 1668A
	EPA 1668C
PCB 175	EPA 1668A
	EPA 1668C
PCB 176	EPA 1668A
	EPA 1668C
PCB 177	EPA 1668A
	EPA 1668C
PCB 178	EPA 1668A
	EPA 1668C
PCB 179	EPA 1668A
	EPA 1668C
PCB 18	EPA 1668A
	EPA 1668C
PCB 180	EPA 1668A
	EPA 1668C
PCB 181	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 182	EPA 1668A
	EPA 1668C
PCB 183	EPA 1668A
	EPA 1668C
PCB 184	EPA 1668A
	EPA 1668C
PCB 185	EPA 1668A
	EPA 1668C
PCB 186	EPA 1668A
	EPA 1668C
PCB 187	EPA 1668A
	EPA 1668C
PCB 188	EPA 1668A
	EPA 1668C
PCB 189	EPA 1668A
	EPA 1668C
PCB 19	EPA 1668A
	EPA 1668C
PCB 190	EPA 1668A
	EPA 1668C
PCB 191	EPA 1668A
	EPA 1668C
PCB 192	EPA 1668A
	EPA 1668C
PCB 193	EPA 1668A
	EPA 1668C
PCB 194	EPA 1668A

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Polychlorinated Biphenyls

PCB 194	EPA 1668C
PCB 195	EPA 1668A
	EPA 1668C
PCB 196	EPA 1668A
	EPA 1668C
PCB 197	EPA 1668A
	EPA 1668C
PCB 198	EPA 1668A
	EPA 1668C
PCB 199	EPA 1668A
	EPA 1668C
PCB 2	EPA 1668A
	EPA 1668C
PCB 20	EPA 1668A
	EPA 1668C
PCB 200	EPA 1668A
	EPA 1668C
PCB 201	EPA 1668A
	EPA 1668C
PCB 202	EPA 1668A
	EPA 1668C
PCB 203	EPA 1668A
	EPA 1668C
PCB 204	EPA 1668A
	EPA 1668C
PCB 205	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 206	EPA 1668A
	EPA 1668C
PCB 207	EPA 1668A
	EPA 1668C
PCB 208	EPA 1668A
	EPA 1668C
PCB 209	EPA 1668A
	EPA 1668C
PCB 21	EPA 1668A
	EPA 1668C
PCB 22	EPA 1668A
	EPA 1668C
PCB 23	EPA 1668A
	EPA 1668C
PCB 24	EPA 1668A
	EPA 1668C
PCB 25	EPA 1668A
	EPA 1668C
PCB 26	EPA 1668A
	EPA 1668C
PCB 27	EPA 1668A
	EPA 1668C
PCB 28	EPA 1668A
	EPA 1668C
PCB 29	EPA 1668A
	EPA 1668C
PCB 3	EPA 1668A

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PCB 3	EPA 1668C
PCB 30	EPA 1668A
	EPA 1668C
PCB 31	EPA 1668A
	EPA 1668C
PCB 32	EPA 1668A
	EPA 1668C
PCB 33	EPA 1668A
	EPA 1668C
PCB 34	EPA 1668A
	EPA 1668C
PCB 35	EPA 1668A
	EPA 1668C
PCB 36	EPA 1668A
	EPA 1668C
PCB 37	EPA 1668A
	EPA 1668C
PCB 38	EPA 1668A
	EPA 1668C
PCB 39	EPA 1668A
	EPA 1668C
PCB 4	EPA 1668A
	EPA 1668C
PCB 40	EPA 1668A
	EPA 1668C
PCB 41	EPA 1668A
	EPA 1668C

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PCB 42	EPA 1668A
	EPA 1668C
PCB 43	EPA 1668A
	EPA 1668C
PCB 44	EPA 1668A
	EPA 1668C
PCB 45	EPA 1668A
	EPA 1668C
PCB 46	EPA 1668A
	EPA 1668C
PCB 47	EPA 1668A
	EPA 1668C
PCB 48	EPA 1668A
	EPA 1668C
PCB 49	EPA 1668A
	EPA 1668C
PCB 5	EPA 1668A
	EPA 1668C
PCB 50	EPA 1668A
	EPA 1668C
PCB 51	EPA 1668A
	EPA 1668C
PCB 52	EPA 1668A
	EPA 1668C
PCB 53	EPA 1668A
	EPA 1668C
PCB 54	EPA 1668A

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PCB 54	EPA 1668C
PCB 55	EPA 1668A
	EPA 1668C
PCB 56	EPA 1668A
	EPA 1668C
PCB 57	EPA 1668A
	EPA 1668C
PCB 58	EPA 1668A
	EPA 1668C
PCB 59	EPA 1668A
	EPA 1668C
PCB 6	EPA 1668A
	EPA 1668C
PCB 60	EPA 1668A
	EPA 1668C
PCB 61	EPA 1668A
	EPA 1668C
PCB 62	EPA 1668A
	EPA 1668C
PCB 63	EPA 1668A
	EPA 1668C
PCB 64	EPA 1668A
	EPA 1668C
PCB 65	EPA 1668A
	EPA 1668C
PCB 66	EPA 1668A
	EPA 1668C

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is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Polychlorinated Biphenyls

PCB 67	EPA 1668A
	EPA 1668C
PCB 68	EPA 1668A
	EPA 1668C
PCB 69	EPA 1668A
	EPA 1668C
PCB 7	EPA 1668A
	EPA 1668C
PCB 70	EPA 1668A
	EPA 1668C
PCB 71	EPA 1668A
	EPA 1668C
PCB 72	EPA 1668A
	EPA 1668C
PCB 73	EPA 1668A
	EPA 1668C
PCB 74	EPA 1668A
	EPA 1668C
PCB 75	EPA 1668A
	EPA 1668C
PCB 76	EPA 1668A
	EPA 1668C
PCB 77	EPA 1668A
	EPA 1668C
PCB 78	EPA 1668A
	EPA 1668C
PCB 79	EPA 1668A

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. JOHN TRIMBLE
ALPHA ANALYTICAL
320 FORBES BOULEVARD
MANSFIELD, MA 02048

NY Lab Id No: 11627

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All approved analytes are listed below:

Polychlorinated Biphenyls

PCB 79	EPA 1668C
PCB 8	EPA 1668A
	EPA 1668C
PCB 80	EPA 1668A
	EPA 1668C
PCB 81	EPA 1668A
	EPA 1668C
PCB 82	EPA 1668A
	EPA 1668C
PCB 83	EPA 1668A
	EPA 1668C
PCB 84	EPA 1668A
	EPA 1668C
PCB 85	EPA 1668A
	EPA 1668C
PCB 86	EPA 1668A
	EPA 1668C
PCB 87	EPA 1668A
	EPA 1668C
PCB 88	EPA 1668A
	EPA 1668C
PCB 89	EPA 1668A
	EPA 1668C
PCB 9	EPA 1668A
	EPA 1668C
PCB 90	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 91	EPA 1668A
	EPA 1668C
PCB 92	EPA 1668A
	EPA 1668C
PCB 93	EPA 1668A
	EPA 1668C
PCB 94	EPA 1668A
	EPA 1668C
PCB 95	EPA 1668A
	EPA 1668C
PCB 96	EPA 1668A
	EPA 1668C
PCB 97	EPA 1668A
	EPA 1668C
PCB 98	EPA 1668A
	EPA 1668C
PCB 99	EPA 1668A
	EPA 1668C

Polynuclear Aromatics

Acenaphthene	EPA 8270E
Acenaphthylene	EPA 8270E
Anthracene	EPA 8270E
Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 8270E
Benzo(b)fluoranthene	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270E
Benzo(k)fluoranthene	EPA 8270E

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Polynuclear Aromatics

Chrysene	EPA 8270E
Dibenzo(a,h)anthracene	EPA 8270E
Fluoranthene	EPA 8270E
Fluorene	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270E
Naphthalene	EPA 8270E
Phenanthrene	EPA 8270E
Pyrene	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270E
2,4-Dichlorophenol	EPA 8270E
2,4-Dimethylphenol	EPA 8270E
2,4-Dinitrophenol	EPA 8270E
2-Chlorophenol	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270E
2-Methylphenol	EPA 8270E
2-Nitrophenol	EPA 8270E
3-Methylphenol	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270E
4-Methylphenol	EPA 8270E
4-Nitrophenol	EPA 8270E
Pentachlorophenol	EPA 8270E
Phenol	EPA 8270E

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Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270D
	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
	EPA 8270E
2-Methylnaphthalene	EPA 8270D
	EPA 8270E
Acetophenone	EPA 8270D
	EPA 8270E
Benzaldehyde	EPA 8270D
	EPA 8270E
Benzoic Acid	EPA 8270D
	EPA 8270E
Benzyl alcohol	EPA 8270D
	EPA 8270E
Caprolactam	EPA 8270D
	EPA 8270E
Dibenzofuran	EPA 8270D
	EPA 8270E

Volatiles Organics

1,4-Dioxane	EPA 8270D SIM
	EPA 8270E SIM
Ethylene Glycol	EPA 8015D
Isobutyl alcohol	EPA 8015D

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Volatiles Organics

Methanol	EPA 8015D
Propylene Glycol	EPA 8015D

Sample Preparation Methods

	EPA 3015A
	EPA 3005A
	EPA 3510C

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Amines

1,2-Diphenylhydrazine	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 8270E
Carbazole	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 8270E
Benzidine	EPA 8270E

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Pentachloronitrobenzene	EPA 8270D
	EPA 8270E
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,4,5-Tetrachlorobenzene	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270E
2-Chloronaphthalene	EPA 8270E
Hexachlorobenzene	EPA 8270E
Hexachlorobutadiene	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270E
Hexachloroethane	EPA 8270E

Dioxins and Furans

1,2,3,4,6,7,8,9-Octachlorodibenzofura	EPA 8290A
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-d	EPA 8290A
1,2,3,4,6,7,8-Heptachlorodibenzofurar	EPA 8290A
1,2,3,4,6,7,8-Heptachlorodibenzo-p-di	EPA 8290A
1,2,3,4,7,8,9-Heptachlorodibenzofurar	EPA 8290A
1,2,3,4,7,8-Hexachlorodibenzofuran	EPA 8290A
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxi	EPA 8290A

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Dioxins and Furans

1,2,3,6,7,8-Hexachlorodibenzofuran	EPA 8290A
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxi	EPA 8290A
1,2,3,7,8,9-Hexachlorodibenzofuran	EPA 8290A
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxi	EPA 8290A
1,2,3,7,8-Pentachlorodibenzofuran	EPA 8290A
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	EPA 8290A
2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A
2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A
2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A
2,3,7,8-Tetrachlorodibenzo-p-dioxin	EPA 8290A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270E

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270E SIM
Acenaphthylene Low Level	EPA 8270E SIM
Anthracene Low Level	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270E SIM
Chrysene Low Level	EPA 8270E SIM

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Low Level Polynuclear Aromatic Hydrocarbons

Dibenzo(a,h)anthracene Low Level	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270E SIM
Fluorene Low Level	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270E SIM
Naphthalene Low Level	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270E SIM
Pyrene Low Level	EPA 8270E SIM

Metals I

Barium, Total	EPA 6010D
	EPA 6020B
Cadmium, Total	EPA 6010D
	EPA 6020B
Calcium, Total	EPA 6010D
	EPA 6020B
Chromium, Total	EPA 6010D
	EPA 6020B
Copper, Total	EPA 6010D
	EPA 6020B
Iron, Total	EPA 6010D
	EPA 6020B
Lead, Total	EPA 6010D
	EPA 6020B
Magnesium, Total	EPA 6010D
	EPA 6020B
Manganese, Total	EPA 6010D
	EPA 6020B
Nickel, Total	EPA 6010D

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Metals I

Nickel, Total	EPA 6020B
Potassium, Total	EPA 6010D
	EPA 6020B
Silver, Total	EPA 6010D
	EPA 6020B
Sodium, Total	EPA 6010D
	EPA 6020B
Strontium, Total	EPA 6010D
	EPA 6020B

Metals II

Aluminum, Total	EPA 6010D
	EPA 6020B
Antimony, Total	EPA 6010D
	EPA 6020B
Arsenic, Total	EPA 6010D
	EPA 6020B
Beryllium, Total	EPA 6010D
	EPA 6020B
Mercury, Total	EPA 7471B
	EPA 7474
Selenium, Total	EPA 6010D
	EPA 6020B
Vanadium, Total	EPA 6010D
	EPA 6020B
Zinc, Total	EPA 6010D
	EPA 6020B

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Metals III

Cobalt, Total	EPA 6010D
	EPA 6020B
Molybdenum, Total	EPA 6010D
	EPA 6020B
Thallium, Total	EPA 6010D
	EPA 6020B
Tin, Total	EPA 6010D
	EPA 6020B
Titanium, Total	EPA 6010D

Miscellaneous

Boron, Total	EPA 6010D
Organic Carbon, Total	Lloyd Kahn Method
	EPA 9060A

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270E
2,6-Dinitrotoluene	EPA 8270E
Isophorone	EPA 8270E
Nitrobenzene	EPA 8270E
Pyridine	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270E

Perfluorinated Alkyl Acids

8:2FTS	EPA 1633 (Draft)
NETFOSAA	EPA 1633 (Draft)

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Perfluorinated Alkyl Acids

NMEFOSAA	EPA 1633 (Draft)
Perflourotridecanoic Acid (PFTRDA)	EPA 1633 (Draft)
Perfluordecanoic Acid (PFDA)	EPA 1633 (Draft)
Perfluorobutanoic Acid (PFBA)	EPA 1633 (Draft)
Perfluorododecanoic Acid (PFDOA)	EPA 1633 (Draft)
Perfluoroheptanoic Acid (PFHPA)	EPA 1633 (Draft)
Perfluorohexanoic Acid (PFHXA)	EPA 1633 (Draft)
Perfluorononanoic Acid (PFNA)	EPA 1633 (Draft)
Perfluorooctanesulfonic Acid (PFOS)	EPA 1633 (Draft)
Perfluorooctanoic Acid (PFOA)	EPA 1633 (Draft)
Perfluoropentanoic Acid (PFPEA)	EPA 1633 (Draft)
Perfluorotetradecanoic Acid (PFTA)	EPA 1633 (Draft)
Perfluoroundecanoic Acid (PFUNA)	EPA 1633 (Draft)

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D

Phthalate Esters

Benzyl butyl phthalate	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 8270E
Diethyl phthalate	EPA 8270E
Dimethyl phthalate	EPA 8270E
Di-n-butyl phthalate	EPA 8270E
Di-n-octyl phthalate	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A

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CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. JOHN TRIMBLE
ALPHA ANALYTICAL
320 FORBES BOULEVARD
MANSFIELD, MA 02048

NY Lab Id No: 11627

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
PCB 1	EPA 1668A
	EPA 1668C
PCB 10	EPA 1668A
	EPA 1668C
PCB 100	EPA 1668A
	EPA 1668C
PCB 101	EPA 1668A
	EPA 1668C
PCB 102	EPA 1668A
	EPA 1668C
PCB 103	EPA 1668A
	EPA 1668C
PCB 104	EPA 1668A
	EPA 1668C
PCB 105	EPA 1668A
	EPA 1668C
PCB 106	EPA 1668A
	EPA 1668C
PCB 107	EPA 1668A
	EPA 1668C
PCB 108	EPA 1668A

Serial No.: 67089

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Polychlorinated Biphenyls

PCB 108	EPA 1668C
PCB 109	EPA 1668A
	EPA 1668C
PCB 11	EPA 1668A
	EPA 1668C
PCB 110	EPA 1668A
	EPA 1668C
PCB 111	EPA 1668A
	EPA 1668C
PCB 112	EPA 1668A
	EPA 1668C
PCB 113	EPA 1668A
	EPA 1668C
PCB 114	EPA 1668A
	EPA 1668C
PCB 115	EPA 1668A
	EPA 1668C
PCB 116	EPA 1668A
	EPA 1668C
PCB 117	EPA 1668A
	EPA 1668C
PCB 118	EPA 1668A
	EPA 1668C
PCB 119	EPA 1668A
	EPA 1668C
PCB 12	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 120	EPA 1668A
	EPA 1668C
PCB 121	EPA 1668A
	EPA 1668C
PCB 122	EPA 1668A
	EPA 1668C
PCB 123	EPA 1668A
	EPA 1668C
PCB 124	EPA 1668A
	EPA 1668C
PCB 125	EPA 1668A
	EPA 1668C
PCB 126	EPA 1668A
	EPA 1668C
PCB 127	EPA 1668A
	EPA 1668C
PCB 128	EPA 1668A
	EPA 1668C
PCB 129	EPA 1668A
	EPA 1668C
PCB 13	EPA 1668A
	EPA 1668C
PCB 130	EPA 1668A
	EPA 1668C
PCB 131	EPA 1668A
	EPA 1668C
PCB 132	EPA 1668A

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Polychlorinated Biphenyls

PCB 132	EPA 1668C
PCB 133	EPA 1668A
	EPA 1668C
PCB 134	EPA 1668A
	EPA 1668C
PCB 135	EPA 1668A
	EPA 1668C
PCB 136	EPA 1668A
	EPA 1668C
PCB 137	EPA 1668A
	EPA 1668C
PCB 138	EPA 1668A
	EPA 1668C
PCB 139	EPA 1668A
	EPA 1668C
PCB 14	EPA 1668A
	EPA 1668C
PCB 140	EPA 1668A
	EPA 1668C
PCB 141	EPA 1668A
	EPA 1668C
PCB 142	EPA 1668A
	EPA 1668C
PCB 143	EPA 1668A
	EPA 1668C
PCB 144	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 145	EPA 1668A
	EPA 1668C
PCB 146	EPA 1668A
	EPA 1668C
PCB 147	EPA 1668A
	EPA 1668C
PCB 148	EPA 1668A
	EPA 1668C
PCB 149	EPA 1668A
	EPA 1668C
PCB 15	EPA 1668A
	EPA 1668C
PCB 150	EPA 1668A
	EPA 1668C
PCB 151	EPA 1668A
	EPA 1668C
PCB 152	EPA 1668A
	EPA 1668C
PCB 153	EPA 1668A
	EPA 1668C
PCB 154	EPA 1668A
	EPA 1668C
PCB 155	EPA 1668A
	EPA 1668C
PCB 156	EPA 1668A
	EPA 1668C
PCB 157	EPA 1668A

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Polychlorinated Biphenyls

PCB 157	EPA 1668C
PCB 158	EPA 1668A
	EPA 1668C
PCB 159	EPA 1668A
	EPA 1668C
PCB 16	EPA 1668A
	EPA 1668C
PCB 160	EPA 1668A
	EPA 1668C
PCB 161	EPA 1668A
	EPA 1668C
PCB 162	EPA 1668A
	EPA 1668C
PCB 163	EPA 1668A
	EPA 1668C
PCB 164	EPA 1668A
	EPA 1668C
PCB 165	EPA 1668A
	EPA 1668C
PCB 166	EPA 1668A
	EPA 1668C
PCB 167	EPA 1668A
	EPA 1668C
PCB 168	EPA 1668A
	EPA 1668C
PCB 169	EPA 1668A
	EPA 1668C

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PCB 17	EPA 1668A
	EPA 1668C
PCB 170	EPA 1668A
	EPA 1668C
PCB 171	EPA 1668A
	EPA 1668C
PCB 172	EPA 1668A
	EPA 1668C
PCB 173	EPA 1668A
	EPA 1668C
PCB 174	EPA 1668A
	EPA 1668C
PCB 175	EPA 1668A
	EPA 1668C
PCB 176	EPA 1668A
	EPA 1668C
PCB 177	EPA 1668A
	EPA 1668C
PCB 178	EPA 1668A
	EPA 1668C
PCB 179	EPA 1668A
	EPA 1668C
PCB 18	EPA 1668A
	EPA 1668C
PCB 180	EPA 1668A
	EPA 1668C
PCB 181	EPA 1668A

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Polychlorinated Biphenyls

PCB 181	EPA 1668C
PCB 182	EPA 1668A
	EPA 1668C
PCB 183	EPA 1668A
	EPA 1668C
PCB 184	EPA 1668A
	EPA 1668C
PCB 185	EPA 1668A
	EPA 1668C
PCB 186	EPA 1668A
	EPA 1668C
PCB 187	EPA 1668A
	EPA 1668C
PCB 188	EPA 1668A
	EPA 1668C
PCB 189	EPA 1668A
	EPA 1668C
PCB 19	EPA 1668A
	EPA 1668C
PCB 190	EPA 1668A
	EPA 1668C
PCB 191	EPA 1668A
	EPA 1668C
PCB 192	EPA 1668A
	EPA 1668C
PCB 193	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 194	EPA 1668A
	EPA 1668C
PCB 195	EPA 1668A
	EPA 1668C
PCB 196	EPA 1668A
	EPA 1668C
PCB 197	EPA 1668A
	EPA 1668C
PCB 198	EPA 1668A
	EPA 1668C
PCB 199	EPA 1668A
	EPA 1668C
PCB 2	EPA 1668A
	EPA 1668C
PCB 20	EPA 1668A
	EPA 1668C
PCB 200	EPA 1668A
	EPA 1668C
PCB 201	EPA 1668A
	EPA 1668C
PCB 202	EPA 1668A
	EPA 1668C
PCB 203	EPA 1668A
	EPA 1668C
PCB 204	EPA 1668A
	EPA 1668C
PCB 205	EPA 1668A

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Polychlorinated Biphenyls

PCB 205	EPA 1668C
PCB 206	EPA 1668A
	EPA 1668C
PCB 207	EPA 1668A
	EPA 1668C
PCB 208	EPA 1668A
	EPA 1668C
PCB 209	EPA 1668A
	EPA 1668C
PCB 21	EPA 1668A
	EPA 1668C
PCB 22	EPA 1668A
	EPA 1668C
PCB 23	EPA 1668A
	EPA 1668C
PCB 24	EPA 1668A
	EPA 1668C
PCB 25	EPA 1668A
	EPA 1668C
PCB 26	EPA 1668A
	EPA 1668C
PCB 27	EPA 1668A
	EPA 1668C
PCB 28	EPA 1668A
	EPA 1668C
PCB 29	EPA 1668A
	EPA 1668C

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PCB 3	EPA 1668A
	EPA 1668C
PCB 30	EPA 1668A
	EPA 1668C
PCB 31	EPA 1668A
	EPA 1668C
PCB 32	EPA 1668A
	EPA 1668C
PCB 33	EPA 1668A
	EPA 1668C
PCB 34	EPA 1668A
	EPA 1668C
PCB 35	EPA 1668A
	EPA 1668C
PCB 36	EPA 1668A
	EPA 1668C
PCB 37	EPA 1668A
	EPA 1668C
PCB 38	EPA 1668A
	EPA 1668C
PCB 39	EPA 1668A
	EPA 1668C
PCB 4	EPA 1668A
	EPA 1668C
PCB 40	EPA 1668A
	EPA 1668C
PCB 41	EPA 1668A

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PCB 41	EPA 1668C
PCB 42	EPA 1668A
	EPA 1668C
PCB 43	EPA 1668A
	EPA 1668C
PCB 44	EPA 1668A
	EPA 1668C
PCB 45	EPA 1668A
	EPA 1668C
PCB 46	EPA 1668A
	EPA 1668C
PCB 47	EPA 1668A
	EPA 1668C
PCB 48	EPA 1668A
	EPA 1668C
PCB 49	EPA 1668A
	EPA 1668C
PCB 5	EPA 1668A
	EPA 1668C
PCB 50	EPA 1668A
	EPA 1668C
PCB 51	EPA 1668A
	EPA 1668C
PCB 52	EPA 1668A
	EPA 1668C
PCB 53	EPA 1668A
	EPA 1668C

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PCB 54	EPA 1668A
	EPA 1668C
PCB 55	EPA 1668A
	EPA 1668C
PCB 56	EPA 1668A
	EPA 1668C
PCB 57	EPA 1668A
	EPA 1668C
PCB 58	EPA 1668A
	EPA 1668C
PCB 59	EPA 1668A
	EPA 1668C
PCB 6	EPA 1668A
	EPA 1668C
PCB 60	EPA 1668A
	EPA 1668C
PCB 61	EPA 1668A
	EPA 1668C
PCB 62	EPA 1668A
	EPA 1668C
PCB 63	EPA 1668A
	EPA 1668C
PCB 64	EPA 1668A
	EPA 1668C
PCB 65	EPA 1668A
	EPA 1668C
PCB 66	EPA 1668A

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Polychlorinated Biphenyls

PCB 66	EPA 1668C
PCB 67	EPA 1668A
	EPA 1668C
PCB 68	EPA 1668A
	EPA 1668C
PCB 69	EPA 1668A
	EPA 1668C
PCB 7	EPA 1668A
	EPA 1668C
PCB 70	EPA 1668A
	EPA 1668C
PCB 71	EPA 1668A
	EPA 1668C
PCB 72	EPA 1668A
	EPA 1668C
PCB 73	EPA 1668A
	EPA 1668C
PCB 74	EPA 1668A
	EPA 1668C
PCB 75	EPA 1668A
	EPA 1668C
PCB 76	EPA 1668A
	EPA 1668C
PCB 77	EPA 1668A
	EPA 1668C
PCB 78	EPA 1668A
	EPA 1668C

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Polychlorinated Biphenyls

PCB 79	EPA 1668A
	EPA 1668C
PCB 8	EPA 1668A
	EPA 1668C
PCB 80	EPA 1668A
	EPA 1668C
PCB 81	EPA 1668A
	EPA 1668C
PCB 82	EPA 1668A
	EPA 1668C
PCB 83	EPA 1668A
	EPA 1668C
PCB 84	EPA 1668A
	EPA 1668C
PCB 85	EPA 1668A
	EPA 1668C
PCB 86	EPA 1668A
	EPA 1668C
PCB 87	EPA 1668A
	EPA 1668C
PCB 88	EPA 1668A
	EPA 1668C
PCB 89	EPA 1668A
	EPA 1668C
PCB 9	EPA 1668A
	EPA 1668C
PCB 90	EPA 1668A

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WADSWORTH CENTER

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CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. JOHN TRIMBLE
ALPHA ANALYTICAL
320 FORBES BOULEVARD
MANSFIELD, MA 02048

NY Lab Id No: 11627

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls

PCB 90	EPA 1668C
PCB 91	EPA 1668A
	EPA 1668C
PCB 92	EPA 1668A
	EPA 1668C
PCB 93	EPA 1668A
	EPA 1668C
PCB 94	EPA 1668A
	EPA 1668C
PCB 95	EPA 1668A
	EPA 1668C
PCB 96	EPA 1668A
	EPA 1668C
PCB 97	EPA 1668A
	EPA 1668C
PCB 98	EPA 1668A
	EPA 1668C
PCB 99	EPA 1668A
	EPA 1668C

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270E
Acenaphthylene	EPA 8270E
Anthracene	EPA 8270E
Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 8270E
Benzo(b)fluoranthene	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270E

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Polynuclear Aromatic Hydrocarbons

Benzo(k)fluoranthene	EPA 8270E
Chrysene	EPA 8270E
Dibenzo(a,h)anthracene	EPA 8270E
Fluoranthene	EPA 8270E
Fluorene	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270E
Naphthalene	EPA 8270E
Phenanthrene	EPA 8270E
Pyrene	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270E
2,4-Dichlorophenol	EPA 8270E
2,4-Dimethylphenol	EPA 8270E
2,4-Dinitrophenol	EPA 8270E
2-Chlorophenol	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270E
2-Methylphenol	EPA 8270E
2-Nitrophenol	EPA 8270E
3-Methylphenol	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270E
4-Methylphenol	EPA 8270E
4-Nitrophenol	EPA 8270E
Pentachlorophenol	EPA 8270E
Phenol	EPA 8270E

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Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 8270E
Acetophenone	EPA 8270E
Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270E
Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270E
Dibenzofuran	EPA 8270E

Volatile Organics

1,4-Dioxane	EPA 8270E SIM
Ethylene Glycol	EPA 8015D
Isobutyl alcohol	EPA 8015D
tert-butyl alcohol	EPA 8015D

Sample Preparation Methods

	EPA 3570
	EPA 3580A
	EPA 3050B
	EPA 3051A

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MR. MARCO SOARES
ALPHA ANALYTICAL
8 WALKUP DR
WESTBOROUGH, MA 01581-1019

NY Lab Id No: 11148

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Bacteriology

Coliform, Total / E. coli (Qualitative)	SM 20, 21-23 9223B (-04) (Colilert)
E. coli (Enumeration)	SM 20, 21-23 9223B (-04) (Colilert)
Heterotrophic Plate Count	SM 20, 21-23 9215B (-04)

Fuel Additives

Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2

Microextractables

1,2,3-Trichloropropane, Low Level	EPA 504.1
1,2-Dibromo-3-chloropropane, Low Le	EPA 504.1
1,2-Dibromoethane, Low Level	EPA 504.1

Miscellaneous

Odor	SM 21-23 2150 B (-97)
Organic Carbon, Dissolved	SM 21-23 5310C (-00)
Organic Carbon, Total	SM 21-23 5310C (-00)
Turbidity	SM 21-23 2130 B (-01)
	EPA 180.1 Rev. 2.0

Non-Metals

Alkalinity	SM 21-23 2320B (-97)
Chloride	EPA 300.0 Rev. 2.1
Color	SM 21-23 2120B (-01)
Cyanide	SM 20, 21-23 4500-CN E
Fluoride, Total	EPA 300.0 Rev. 2.1
	SM 21-23 4500-F C (-97)
Nitrate (as N)	EPA 353.2 Rev. 2.0
	EPA 300.0 Rev. 2.1
	SM 21-23 4500-NO3 F (-00)

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Non-Metals

Nitrite (as N)	EPA 353.2 Rev. 2.0
	SM 21-23 4500-NO3 F (-00)
	SM 21-23 4500-NO2 B (-00)
Orthophosphate (as P)	SM 19, 21-23 4500-P E (-99)
Solids, Total Dissolved	SM 21-23 2540C (-97)
Specific Conductance	SM 21-23 2510B (-97)
Sulfate (as SO4)	EPA 300.0 Rev. 2.1

Trihalomethanes

Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2
Total Trihalomethanes	EPA 524.2

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2

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Volatile Aromatics

Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2

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Volatile Halocarbons

Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

Sample Preparation Methods

SM 20, 21-23 4500-CN C (-99)

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All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260D
	EPA 624.1
Acrylonitrile	EPA 8260D
	EPA 624.1
Ethyl methacrylate	EPA 8260D
Methyl methacrylate	EPA 8260D

Amines

1,2-Diphenylhydrazine	EPA 625.1
	EPA 8270E
2-Naphthylamine	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 625.1
	EPA 8270E
Carbazole	EPA 625.1
	EPA 8270E
Diphenylamine	EPA 8270E
Pyridine	EPA 625.1
	EPA 8270E

Bacteriology

Coliform, Fecal	Colilert-18
E. coli (Enumeration)	SM 9223B-2016
Heterotrophic Plate Count	SM 18-21 9215B

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Benzidines

3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270E
Benzidine	EPA 625.1
	EPA 8270E

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
	EPA 608.3
4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3
Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B
	EPA 608.3
alpha-Chlordane	EPA 8081B
	EPA 608.3
beta-BHC	EPA 8081B
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3
delta-BHC	EPA 8081B
	EPA 608.3
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3

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Chlorinated Hydrocarbon Pesticides

Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
	EPA 608.3
Heptachlor	EPA 8081B
	EPA 608.3
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Lindane	EPA 8081B
	EPA 608.3
Methoxychlor	EPA 8081B
	EPA 608.3
Mirex	EPA 608.3
PCNB	EPA 8270E
Toxaphene	EPA 8081B
	EPA 608.3

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
1,2,4,5-Tetrachlorobenzene	EPA 8270E
1,2,4-Trichlorobenzene	EPA 625.1

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Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA 8270E
2-Chloronaphthalene	EPA 625.1
	EPA 8270E
Hexachlorobenzene	EPA 625.1
	EPA 8270E
Hexachlorobutadiene	EPA 625.1
	EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270E
Hexachloroethane	EPA 625.1
	EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A

Demand

Biochemical Oxygen Demand	SM 5210B-2016
Carbonaceous BOD	SM 5210B-2016
Chemical Oxygen Demand	EPA 410.4, Rev. 2.0 (1993)
	SM 5220D-2011

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Fuel Oxygenates

Di-isopropyl ether	EPA 8260D
Ethanol	EPA 8260D
	EPA 624.1
Methyl tert-butyl ether	EPA 8260D
	EPA 624.1
tert-amyl methyl ether (TAME)	EPA 8260D
tert-butyl alcohol	EPA 8260D
	EPA 624.1
tert-butyl ethyl ether (ETBE)	EPA 8260D

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 625.1
	EPA 8270E
4-Bromophenylphenyl ether	EPA 625.1
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 625.1
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 625.1
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 625.1
	EPA 8270E

Low Level Halocarbons

1,2,3-Trichloropropane, Low Level	EPA 8011
1,2-Dibromo-3-chloropropane, Low Le	EPA 8011
1,2-Dibromoethane, Low Level	EPA 8011

Low Level Polynuclear Aromatics

Acenaphthene Low Level	EPA 8270E SIM

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All approved analytes are listed below:

Low Level Polynuclear Aromatics

Acenaphthylene Low Level	EPA 8270E SIM
Anthracene Low Level	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270E SIM
Chrysene Low Level	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270E SIM
Fluorene Low Level	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270E SIM
Naphthalene Low Level	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270E SIM
Pyrene Low Level	EPA 8270E SIM

Metals I

Iron, Total	SM 3500-Fe B-2011

Metals II

Chromium VI	EPA 7196A
	SM 3500-Cr B-2011

Mineral

Acidity	SM 2310B-2011
Alkalinity	SM 2320B-2011
Chloride	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-Cl- E-2011
	EPA 9056A

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MR. MARCO SOARES
ALPHA ANALYTICAL
8 WALKUP DR
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Mineral

Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-F- C-2011
	EPA 9056A
Sulfate (as SO4)	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-SO4- E-2011
	EPA 9056A

Miscellaneous

Bromide	EPA 300.0, Rev. 2.1 (1993)
Color	SM 2120B-2011
Cyanide, Total	LACHAT QuikChem 10-204-00-1-X
	EPA 9014
	SM 4500-CN E-2016
	EPA 9012B
Formaldehyde	EPA 8315A
non-Polar Extractable Material (TPH)	EPA 1664B
Oil and Grease Total Recoverable	EPA 1664B
Organic Carbon, Total	SM 5310C-2014
	EPA 9060A
Phenols	EPA 420.1 (Rev. 1978)
	EPA 9065
Specific Conductance	EPA 120.1 (Rev. 1982)
	SM 2510B-2011
	EPA 9050A
Sulfide (as S)	SM 4500-S2- D-2011
Surfactant (MBAS)	SM 5540C-2011
Turbidity	SM 2130 B-2011
	EPA 180.1, Rev. 2.0 (1993)

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Nitroaromatics and Isophorone

1,3-Dinitrobenzene	EPA 8270E
2,4-Dinitrotoluene	EPA 625.1
	EPA 8270E
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270E
Isophorone	EPA 625.1
	EPA 8270E
Nitrobenzene	EPA 625.1
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 625.1
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270E
N-Nitrosodiphenylamine	EPA 625.1
	EPA 8270E

Nutrient

Ammonia (as N)	SM 4500-NH3 H-2011
	EPA 350.1, Rev. 2.0 (1993)
Kjeldahl Nitrogen, Total	EPA 351.1 (Rev. 1978)
	SM 4500-NH3 H-2011
Nitrate (as N)	EPA 353.2, Rev. 2.0 (1993)
	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-NO3 F-2016
	EPA 9056A
Nitrate-Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993)

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Nutrient

Nitrate-Nitrite (as N)	SM 4500-NO3 F-2016
Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993)
	SM 4500-NO3 F-2016
	SM 4500-NO2 B-2011
Orthophosphate (as P)	SM 4500-P E-2011
Phosphorus, Total	SM 4500-P E-2011

Organophosphate Pesticides

Atrazine	EPA 625.1
	EPA 8270E
Parathion ethyl	EPA 8270E
Thionazin	EPA 8270E

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D

Phthalate Esters

Benzyl butyl phthalate	EPA 625.1
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270E
Diethyl phthalate	EPA 625.1
	EPA 8270E
Dimethyl phthalate	EPA 625.1
	EPA 8270E
Di-n-butyl phthalate	EPA 625.1
	EPA 8270E
Di-n-octyl phthalate	EPA 625.1

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Phthalate Esters

Di-n-octyl phthalate	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Polynuclear Aromatics

Acenaphthene	EPA 625.1
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270E
Anthracene	EPA 625.1
	EPA 8270E
Benzo(a)anthracene	EPA 625.1

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Polynuclear Aromatics

Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 625.1
	EPA 8270E
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270E
Benzo(g,h,i)perylene	EPA 625.1
	EPA 8270E
Benzo(k)fluoranthene	EPA 625.1
	EPA 8270E
Chrysene	EPA 625.1
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 625.1
	EPA 8270E
Fluoranthene	EPA 625.1
	EPA 8270E
Fluorene	EPA 625.1
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 625.1
	EPA 8270E
Naphthalene	EPA 625.1
	EPA 8270E
Phenanthrene	EPA 625.1
	EPA 8270E
Pyrene	EPA 625.1
	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270E

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Priority Pollutant Phenols

2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270E
2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270E
2,4-Dichlorophenol	EPA 625.1
	EPA 8270E
2,4-Dimethylphenol	EPA 625.1
	EPA 8270E
2,4-Dinitrophenol	EPA 625.1
	EPA 8270E
2-Chlorophenol	EPA 625.1
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270E
2-Methylphenol	EPA 625.1
	EPA 8270E
2-Nitrophenol	EPA 625.1
	EPA 8270E
3-Methylphenol	EPA 625.1
	EPA 8270E
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270E
4-Methylphenol	EPA 625.1
	EPA 8270E
4-Nitrophenol	EPA 625.1
	EPA 8270E
Cresols, Total	EPA 8270E

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Priority Pollutant Phenols

Pentachlorophenol	EPA 625.1
	EPA 8270E
Phenol	EPA 625.1
	EPA 8270E

Residue

Settleable Solids	SM 2540 F-2015
Solids, Total	SM 2540 B-2015
Solids, Total Dissolved	SM 2540 C-2015
Solids, Total Suspended	SM 2540 D-2015
Solids, Volatile	SM 2540 E-2015

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270E
1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 625.1
	EPA 8270E
Acetophenone	EPA 625.1
	EPA 8270E
Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270E
Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270E
Dibenzofuran	EPA 8270E
n-Decane	EPA 625.1
n-Octadecane	EPA 625.1

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Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D
	EPA 624.1
1,3,5-Trimethylbenzene	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260D
	EPA 624.1
2-Chlorotoluene	EPA 8260D
4-Chlorotoluene	EPA 8260D
Benzene	EPA 8260D
	EPA 624.1
Bromobenzene	EPA 8260D
Chlorobenzene	EPA 8260D
	EPA 624.1
Ethyl benzene	EPA 8260D
	EPA 624.1
Isopropylbenzene	EPA 8260D
m/p-Xylenes	EPA 8260D
Naphthalene, Volatile	EPA 8260D
n-Butylbenzene	EPA 8260D
n-Propylbenzene	EPA 8260D
o-Xylene	EPA 8260D
p-Isopropyltoluene (P-Cymene)	EPA 8260D
sec-Butylbenzene	EPA 8260D
Styrene	EPA 8260D

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Volatile Aromatics

Styrene	EPA 624.1
tert-Butylbenzene	EPA 8260D
Toluene	EPA 8260D
	EPA 624.1
Total Xylenes	EPA 8260D
	EPA 624.1

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 624.1
1,1,2-Trichloroethane	EPA 8260D
	EPA 624.1
1,1-Dichloroethane	EPA 8260D
	EPA 624.1
1,1-Dichloroethene	EPA 8260D
	EPA 624.1
1,1-Dichloropropene	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D
1,2-Dibromoethane	EPA 8260D
1,2-Dichloroethane	EPA 8260D
	EPA 624.1
1,2-Dichloropropane	EPA 8260D

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Volatile Halocarbons

1,2-Dichloropropane	EPA 624.1
1,3-Dichloropropane	EPA 8260D
2,2-Dichloropropane	EPA 8260D
2-Chloroethylvinyl ether	EPA 8260D
	EPA 624.1
Bromochloromethane	EPA 8260D
Bromodichloromethane	EPA 8260D
	EPA 624.1
Bromoform	EPA 8260D
	EPA 624.1
Bromomethane	EPA 8260D
	EPA 624.1
Carbon tetrachloride	EPA 8260D
	EPA 624.1
Chloroethane	EPA 8260D
	EPA 624.1
Chloroform	EPA 8260D
	EPA 624.1
Chloromethane	EPA 8260D
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260D
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260D
	EPA 624.1
Dibromochloromethane	EPA 8260D
	EPA 624.1
Dibromomethane	EPA 8260D

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Volatile Halocarbons

Dichlorodifluoromethane	EPA 8260D
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260D
Methyl iodide	EPA 8260D
Methylene chloride	EPA 8260D
	EPA 624.1
Tetrachloroethene	EPA 8260D
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260D
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260D
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260D
Trichloroethene	EPA 8260D
	EPA 624.1
Trichlorofluoromethane	EPA 8260D
	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 624.1

Volatiles Organics

1,4-Dioxane	EPA 8260D
	EPA 8260C SIM
	EPA 8260D SIM
	EPA 8270E SIM
2-Butanone (Methylethyl ketone)	EPA 8260D
2-Hexanone	EPA 8260D
4-Methyl-2-Pentanone	EPA 8260D

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All approved analytes are listed below:

Volatiles Organics

4-Methyl-2-Pentanone	EPA 624.1
Acetone	EPA 8260D
	EPA 624.1
Carbon Disulfide	EPA 8260D
Cyclohexane	EPA 8260D
Di-ethyl ether	EPA 8260D
Ethyl Acetate	EPA 8260D
Hexane	EPA 8260D
Isopropanol	EPA 8260D
Methyl acetate	EPA 8260D
Methyl cyclohexane	EPA 8260D
n-Butanol	EPA 8260D
o-Toluidine	EPA 8270E
Tetrahydrofuran	EPA 8260D
Vinyl acetate	EPA 8260D
	EPA 624.1

Sample Preparation Methods

SM 4500-P B(5)-2011
EPA 5030C
SM 4500-CN B-2016 and C-2016
EPA 9030B
EPA 3510C
SM 4500-NH3 B-2011
SM 4500-F B-2011
SM 4500-N Org B-2011 or C-2011
EPA 9010C

Serial No.: 67828

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WADSWORTH CENTER

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Revised May 17, 2023

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Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. MARCO SOARES
ALPHA ANALYTICAL
8 WALKUP DR
WESTBOROUGH, MA 01581-1019

NY Lab Id No: 11148

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260D
Acrylonitrile	EPA 8260D
Ethyl methacrylate	EPA 8260D
Methyl methacrylate	EPA 8260D

Amines

1,2-Diphenylhydrazine	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 8270E
Carbazole	EPA 8270E
Diphenylamine	EPA 8270E

Benzidines

3,3'-Dichlorobenzidine	EPA 8270E
Benzidine	EPA 8270E

Characteristic Testing

Corrosivity (pH)	EPA 9040C
	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1030
	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
	EPA 8270E
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Pentachloronitrobenzene	EPA 8270D
	EPA 8270E
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D

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Chlorinated Hydrocarbons

1,2,4,5-Tetrachlorobenzene	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270E
2-Chloronaphthalene	EPA 8270E
Hexachlorobenzene	EPA 8270E
Hexachlorobutadiene	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270E
Hexachloroethane	EPA 8260D
	EPA 8270E

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
MCPA	EPA 8151A
MCPP	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270E

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270E SIM

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Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthylene Low Level	EPA 8270E SIM
Anthracene Low Level	EPA 8270E SIM
Benzo(a)anthracene Low Level	EPA 8270E SIM
Benzo(a)pyrene Low Level	EPA 8270E SIM
Benzo(b)fluoranthene Low Level	EPA 8270E SIM
Benzo(g,h,i)perylene Low Level	EPA 8270E SIM
Benzo(k)fluoranthene Low Level	EPA 8270E SIM
Chrysene Low Level	EPA 8270E SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270E SIM
Fluoranthene Low Level	EPA 8270E SIM
Fluorene Low Level	EPA 8270E SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270E SIM
Naphthalene Low Level	EPA 8270E SIM
Phenanthrene Low Level	EPA 8270E SIM
Pyrene Low Level	EPA 8270E SIM

Metals II

Chromium VI	EPA 7196A

Minerals

Chloride	EPA 9251
Sulfate (as SO4)	EPA 9038

Miscellaneous

Cyanide, Total	EPA 9014
	EPA 9012B
Extractable Organic Halides	EPA 9023
Phenols	EPA 9065
Specific Conductance	EPA 9050A

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Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270E
2,6-Dinitrotoluene	EPA 8270E
Isophorone	EPA 8270E
Nitrobenzene	EPA 8260D
	EPA 8270E
Pyridine	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270E

Organophosphate Pesticides

Parathion ethyl	EPA 8270E

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Oil and Grease Total Recoverable	EPA 9071B (Solvent:Hexane)

Phthalate Esters

Benzyl butyl phthalate	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 8270E
Diethyl phthalate	EPA 8270E
Dimethyl phthalate	EPA 8270E
Di-n-butyl phthalate	EPA 8270E
Di-n-octyl phthalate	EPA 8270E

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A

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Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270E
Acenaphthylene	EPA 8270E
Anthracene	EPA 8270E
Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 8270E
Benzo(b)fluoranthene	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270E
Benzo(k)fluoranthene	EPA 8270E
Chrysene	EPA 8270E

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Polynuclear Aromatic Hydrocarbons

Dibenzo(a,h)anthracene	EPA 8270E
Fluoranthene	EPA 8270E
Fluorene	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 8270E
Naphthalene	EPA 8270E
Phenanthrene	EPA 8270E
Pyrene	EPA 8270E

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270E
2,4,5-Trichlorophenol	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270E
2,4-Dichlorophenol	EPA 8270E
2,4-Dimethylphenol	EPA 8270E
2,4-Dinitrophenol	EPA 8270E
2-Chlorophenol	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270E
2-Methylphenol	EPA 8270E
2-Nitrophenol	EPA 8270E
3-Methylphenol	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270E
4-Methylphenol	EPA 8270E
4-Nitrophenol	EPA 8270E
Pentachlorophenol	EPA 8270E
Phenol	EPA 8270E

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270E

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Semi-Volatile Organics

1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 8270E
Acetophenone	EPA 8270E
Benzaldehyde	EPA 8270E
Benzoic Acid	EPA 8270E
Benzyl alcohol	EPA 8270E
Caprolactam	EPA 8270E
Dibenzofuran	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D
1,3,5-Trimethylbenzene	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D
1,4-Dichlorobenzene	EPA 8260D
2-Chlorotoluene	EPA 8260D
4-Chlorotoluene	EPA 8260D
Benzene	EPA 8260D
Bromobenzene	EPA 8260D
Chlorobenzene	EPA 8260D
Ethyl benzene	EPA 8260D
Isopropylbenzene	EPA 8260D
m/p-Xylenes	EPA 8260D
Naphthalene, Volatile	EPA 8260D
n-Butylbenzene	EPA 8260D

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Volatile Aromatics

n-Propylbenzene	EPA 8260D
o-Xylene	EPA 8260D
p-Isopropyltoluene (P-Cymene)	EPA 8260D
sec-Butylbenzene	EPA 8260D
Styrene	EPA 8260D
tert-Butylbenzene	EPA 8260D
Toluene	EPA 8260D
Total Xylenes	EPA 8260D

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D
1,1,2,2-Tetrachloroethane	EPA 8260D
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
1,1,2-Trichloroethane	EPA 8260D
1,1-Dichloroethane	EPA 8260D
1,1-Dichloroethene	EPA 8260D
1,1-Dichloropropene	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D
1,2-Dibromoethane	EPA 8260D
1,2-Dichloroethane	EPA 8260D
1,2-Dichloropropane	EPA 8260D
1,3-Dichloropropane	EPA 8260D
2,2-Dichloropropane	EPA 8260D
2-Chloroethylvinyl ether	EPA 8260D
3-Chloropropene (Allyl chloride)	EPA 8260D
Bromochloromethane	EPA 8260D

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Volatile Halocarbons

Bromodichloromethane	EPA 8260D
Bromoform	EPA 8260D
Bromomethane	EPA 8260D
Carbon tetrachloride	EPA 8260D
Chloroethane	EPA 8260D
Chloroform	EPA 8260D
Chloromethane	EPA 8260D
cis-1,2-Dichloroethene	EPA 8260D
cis-1,3-Dichloropropene	EPA 8260D
Dibromochloromethane	EPA 8260D
Dibromomethane	EPA 8260D
Dichlorodifluoromethane	EPA 8260D
Hexachlorobutadiene, Volatile	EPA 8260D
Methyl iodide	EPA 8260D
Methylene chloride	EPA 8260D
Tetrachloroethene	EPA 8260D
trans-1,2-Dichloroethene	EPA 8260D
trans-1,3-Dichloropropene	EPA 8260D
trans-1,4-Dichloro-2-butene	EPA 8260D
Trichloroethene	EPA 8260D
Trichlorofluoromethane	EPA 8260D
Vinyl chloride	EPA 8260D

Volatile Organics

1,4-Dioxane	EPA 8260D
	EPA 8270E
2-Butanone (Methylethyl ketone)	EPA 8260D
2-Hexanone	EPA 8260D

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Volatile Organics

2-Nitropropane	EPA 8260D
4-Methyl-2-Pentanone	EPA 8260D
Acetone	EPA 8260D
Carbon Disulfide	EPA 8260D
Cyclohexane	EPA 8260D
Di-ethyl ether	EPA 8260D
Ethyl Acetate	EPA 8260D
Hexane	EPA 8260D
Methyl acetate	EPA 8260D
Methyl cyclohexane	EPA 8260D
Methyl tert-butyl ether	EPA 8260D
n-Butanol	EPA 8260D
tert-butyl alcohol	EPA 8260D
Tetrahydrofuran	EPA 8260D
Vinyl acetate	EPA 8260D

Sample Preparation Methods

EPA 5035A-L
EPA 5035A-H
EPA 3580A
EPA 3540C
EPA 3546
EPA 3060A
EPA 9010C

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APPENDIX G

Project Personnel Resumes

Appendix G – Organization Chart
130 St. Felix Street
Brooklyn, New York

Title	**Personnel Name and Contact**
130 Saint Felix LLC	Bryan Kelly Telephone: (212) 716-2502
Langan Project Manager:	Jessica Friscia Telephone: (973) 560-4900
Langan Quality Assurance Officer (QAO):	Christopher McMahon Telephone: (973) 560-4900
Langan Remedial Engineer:	Ron Boyer Telephone: (973) 560-4900
Program Quality Assurance Monitor:	Lauren Kott Telephone: (973) 560-4900
Data Validator:	Joseph Conboy Telephone: (215) 845-8985
Laboratory Representative:	Alpha Analytical, Inc. Ben Rao Telephone: (201) 847-9100

RONALD D. BOYER, PE

PRINCIPAL/VICE PRESIDENT

GEOTECHNICAL ENGINEERING

Mr. Boyer is an experienced geotechnical engineer whose practice involves coordination and supervision of subsurface investigations; establishment and monitoring of geotechnical instrumentation; design of shallow and deep foundation systems; evaluation of earth slope stability; design and inspection of subgrade improvement applications; preparation of geotechnical engineering reports and construction specifications; performance of pre-construction conditions documentation; coordination and supervision of construction inspection services; and monitoring of adjacent structures during demolition and construction.

SELECTED PROJECTS

- 11 Hubert Street, New York, NY
- 110 University Place, New York, NY
- 111 Murray Street Development, New York, NY
- 120 Neptune Avenue, Brooklyn, NY
- 125 Greenwich Street Development, New York, NY
- 150 Amsterdam Avenue, New York, NY
- 22 Thames Street, New York, NY
- 225 East 39th Street Development, New York, NY
- 2329 Nostrand Avenue, Brooklyn, NY
- 259 West 10th Street, New York, NY
- 315 East 46th Street, New York, NY
- 414 West 15thh Street, New York, NY
- 485 Fifth Avenue, New York, NY
- 510 West 22nd Street, New York, NY
- 57 Reade Street Development, New York, NY
- 92 Fulton Street, New York, NY
- American Dream Meadowlands, East Rutherford, NJ
- Avalon Bay, Boonton, NJ
- Bank Street Commons, White Plains, NY
- Brooklyn Law School Dormitory, Brooklyn, NY
- Cape Liberty Cruise Port, Bayonne, NJ
- CarMax - Waterbury, CT
- Christian Cultural Center, Brooklyn, NY
- Christiana Phase 2 Retail Development, Christiana, DE
- Circuit City Store, Wayne, NJ
- Clifton Commons, Clifton, NJ
- Colgate-Palmolive Waterfront Development, Various Locations
- Daily News Printing Press Facility, Jersey City, NJ
- DDC Rikers Island, New York, NY
- Essex Street Roadway Improvements, Hackensack, NJ
- Fifth Avenue Presbyterian Church, New York, NY
- General Motors - Lighthouse Landing, Sleepy Hollow, NY
- Giants Training Facility, East Rutherford, NJ
- Golden Orchards Geotechnical Support, Washington Township, NJ

EDUCATION

M.S., Civil Engineering (Geotechnical) Virginia Tech

B.S., Civil Engineering Virginia Tech

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ, NY

AFFILIATIONS

Deep Foundations Institute (DFI)

American Institute of Architects

Associated General Contractors of NJ

- Greenwich School, Greenwich, NJ
- Hudson County Courthouse, Jersey City, NJ
- K. Hovnanian at Bedminster Stormwater Detention System, Bedminster, NJ
- Kinko's, Norwalk, CT
- Kohl's Distribution Center, Mamakating, NY
- Lehman Brothers Data Center, Cranford, NJ
- Lehman Brothers Data Center, Piscataway, NJ
- Lowe's Norwalk, CT
- MetLife Stadium, East Rutherford, NJ
- Metropolitan Executive Towers, East Rutherford, NJ
- Morgan Stanley Data Center, Somerset, NJ
- Morristown Airport Hanger, Morristown, NJ
- MOMA West, New York, NY
- Newark International Airport, CONRac, Newark, NJ
- Newark International Airport, AirTrain Replacement, Newark, NJ
- New Britain Retail Center, New Britain, CT
- Northwest Airlines Cargo Facility, JFK International Airport, Queens, NY
- Norwalk Retail Development, Norwalk, CT
- One Bridge Plaza, Fort Lee, NJ
- PRBC - Medical Office Building, East Stroudsburg, PA
- Prospect Plaza, Brooklyn, NY
- PSEG Overhead Transmission, Throughout NJ
- River Bend at Port Imperial, West New York, NJ
- River Street Redevelopment, Hackensack, NJ
- Riverfront Stadium Redevelopment, Newark, NJ
- Riverside Square Mall Expansion, Hackensack, NJ
- Roosevelt Island DEP Seawall, New York, NY
- Roosevelt Island Park, Esplanade and Seawall, New York, NY
- Route 209 Expansion, Mamakating, NY
- Route 3 Flyover Bridge, Meadowlands, East Rutherford, NJ
- St Barnabas Hospital, Livingston, NJ
- Stevens Institute of Technology, Student Housing and University Center, Hoboken, NJ
- Stop & Shop, Various Locations
- T172 & S171N Transmission Lines, North Smithfield, RI
- Target Development, Bethel, CT
- Target Store, Horn Lake, MS
- Temporary Office Trailer Complex, East Rutherford, NJ
- The Standard, New York, NY
- The Venetian, Brooklyn, NY
- Westlakes Office Complex, Berwyn, PA
- Yonkers Avenue Bridge, Westchester County, NY

Christopher McMahon, CHMM

Associate

Brownfield Redevelopment, Environmental Site Assessments, Site Investigation/Remedial Actions, Vapor Intrusion Investigations

15 years in the industry ~ 9 years with Langan

Mr. McMahon is a consulting geologist whose primary focus within his tenure at Langan has been in providing environmental support to redevelopment sites within the metropolitan New York area. He has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup, Voluntary Cleanup and Spill Programs, and New York City Office of Environmental Remediation E-Designated and New York City Voluntary Cleanup Program sites. These projects have included the completion of Phase I environmental site assessments, Phase II and remedial investigations, UST closures, NYSDEC closures and remedial excavation oversight for off-site disposal and/or treatment. Mr. McMahon also has significant field experience including implementation and management of all phases of environmental projects involving soil, sediment, groundwater, surface water, and soil vapor contamination including Phase I inspections, Phase II site investigations, Remedial Investigations, and Remedial Actions.

Many of these projects have included his oversight of remedial actions to clean up or mitigate hazardous waste sites in rural, urban, and industrial settings. These remedial action designs have included in-situ soil remedial injections, contaminated soil removal/disposal management plans, and soil vapor intrusion mitigation systems including advanced vapor barriers and sub-slab depressurization systems.

Selected Projects

NYSDEC Brownfield Redevelopment 363 and 365 Bond Street, Brooklyn, NY
NYSDEC Brownfield Redevelopment, Fashion Outlets of Niagara Falls, NY
NYSDEC Spills Redevelopment, 540 West 26th Street, New York, NY
NYSDEC Spills Redevelopment, 101 Murray Street, New York, NY
NYSDEC Spills Redevelopment, 110 University Place, New York, NY
NYSDEC Spills Redevelopment, Grant Park, Yonkers, NY
NYSDEC Spills Redevelopment, The Shops At Nanuet, Nanuet, NY
NYCOER E-Designation Remediation, 505 W 19th Street, New York, NY
NYCOER E-Designation Remediation, 53 West 53rd Street, New York, NY
NYCOER E-Designation Remediation, 525 West 52nd Street, New York, NY
NYCOER E-Designation Remediation, 412 Greenwich Street, New York, NY
NYCOER E-Designation Remediation, 508 West 24th Street, New York, NY
NYSDEC (Region 7) Site Remedial Investigation, Hillcrest, NY
Former Manufactured Gas Plant Site Remedial Investigation, Geneva, NY
NYSDEC (Region 2) Superfund Site Remedial Investigation, Jamaica, NY
NYSDEC (Region 5) Superfund Site Remedial Investigation, Whitehall, NY
Former Manufactured Gas Plant Site Investigation/Confidential Client, Mechanicville, NY
Remedial Investigation of Industrial Facility/Confidential Client, Batavia, NY
OGS Geotechnical Survey for Construction, Rome, NY

Education

B. A., Geology, State University of New York College at Potsdam
With Honors in Geology and Environmental Science

Professional Registration

Certified Hazardous Materials Manager (CHMM)

OSHA 29 CFR 1910.120 Certification for Hazardous Waste Operations and Emergency Response

OSHA Certification for Hazardous Waste Site Supervisor

Red Cross CPR & First Aid Training

LANGAN

ANTHONY MOFFA, JR., ASP, CHMM, COSS, CSP

ASSOCIATE/CORPORATE HEALTH AND SAFETY MANAGER

Anthony is Langan's Corporate Health & Safety Manager and is responsible for managing health and safety compliance in all Langan office locations. He has nearly 20 years of experience in the health and safety field. He is responsible for ensuring compliance with all federal and state occupational health and safety laws and development and implementation of corporate health and safety policies. His responsibilities include reviewing and updating Langan's Corporate Health and Safety Program and assisting employees in the development of site specific Health & Safety Plans. He maintains and manages health and safety records for employees in all Langan office locations including medical evaluations, respirator fit testing, and Hazardous Waste Operations and Emergency Response training. He is also responsible for documentation and investigation of work-related injuries and incidents and sharing this information with employees to assist in the prevention of future incidents. He is also the chairman of the Corporate Health & Safety Committee and Health & Safety Leadership Team that meet periodically throughout the year. He is responsible for coordinating and providing health and safe training to Langan employees. He was formerly the Environmental, Health and Safety Coordinator at a chemical manufacturer. His experience included employee hazard communications, development of material safety data sheets for developed products, respirator fit testing and conducting required Occupational Health & Safety Association and Department of Transportation training.

EDUCATION

B.S., Physics
West Chester University

PROFESSIONAL REGISTRATION

Associate Safety Professional (ASP)

Certified Hazardous Material Manager (CHMM)

Certified Occupational Safety Specialist (COSS)

Certified Safety Professional (CSP)

AFFILIATIONS

Pennsylvania Chamber of Business & Industry

Chemical Council of New Jersey

New Jersey Business & Industry Association

Geoprofessional Business Association

American Society of Safety Professionals

JESSICA FRISCIA, PE

PROJECT ENGINEER

ENVIRONMENTAL ENGINEERING

Ms. Friscia's experience includes field work and office work on environmental investigation and remediation projects across New Jersey and New York. Her field work experience includes soil, soil vapor, and groundwater sampling; drilling oversight; air monitoring; soil management; and remediation oversight, including excavation, zero-valent iron injections, air sparge/SVE system installation, MPE system installation, and SSDS installation. Her office work experience includes EQuIS database management, data evaluation, remedial design, and report work, including, but not limited to, Phase I ESAs, Preliminary Assessment/Site Investigations, Remedial Investigation Reports, Remedial Action Work Plans, and Remedial Action Reports.

SELECTED PROJECTS

- Former Penick Corporation Facility RCRA Site, Montville, NJ
- Bond Street Brownfields Redevelopment Site, Brooklyn, NY
- CPS/Madison Industries Superfund Site, Old Bridge, NJ
- Rossville Avenue Brownfields Site, Staten Island, NY
- Surf Avenue Brownfields Site, Brooklyn, NY
- St. Felix Street Brownfields Site, Brooklyn, NY
- 42-50 24th Street E-Designated / VCP Site, Long Island City, NY
- 1538 Stillwell Avenue E-Designated / VCP Site, Bronx, NY
- 1905 Surf Avenue E-Designated Site, Brooklyn, NY
- Shrewsbury Avenue LSRP Site, Tinton Falls, NJ
- Church Road LSRP Site, Cherry Hill, NJ
- Former Pan Graphics Facility, Garfield, NJ
- Former Flintkote Company Facility Site, East Rutherford, NJ
- Former Agricultural Research Facility, West Windsor, NJ
- Liberty Plaza VCP Site, Randallstown, MD
- Consolidated Edison Site, New York, NY
- Kent Avenue Site, Brooklyn, NY
- 505 West 19th Street NYCOER E-Designated Site, New York, NY
- 401 Washington Street NYCOER E-Designated Site, New York, NY
- 400 Park Avenue South Site NYCOER E-Designated Site, New York, NY
- Phase I Environmental Site Assessments and Due Diligence Investigations, Various Sites, NY/NJ

EDUCATION

M.E., Environmental and Water Quality Engineering
Massachusetts Institute of Technology

B.E., Civil Engineering
The Cooper Union for the Advancement of Science and Art

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NY

OSHA 40-Hour HAZWOPER 29 CFR 1910.120(e)(4) Certification

AFFILIATIONS

Beverly Willis Architecture Foundation Emerging Leaders Program

CREW

Steven Ciambruschini, PG, LEP

Principal/Vice President

Environmental Site Assessments/Investigations, Brownfield Remediation, UST Management

33 years in the industry ~ 28 years with Langan

Mr. Ciambruschini has over 30 years of experience in hydrogeologic and environmental investigations including management of environmental and geotechnical investigations relating to petroleum and chlorinated solvent spill sites, underground storage tank sites, manufactured gas plant sites, landfills, wastewater treatment facilities and industrial/commercial sites. His experience includes managing environmental compliance audits, remedial investigation, pre-acquisition due diligence and permitting assessment, feasibility studies and design, construction and operation of complex innovative remediation systems to treat, contain and recover contaminated soil and groundwater. These projects are managed under various NJDEP, PADEP, NYDEC, NYCDEP and CTDEP programs. Mr. Ciambruschini provides consultation to a diverse group of clients including private developers, utilities, retail and industrial facilities and is expert in assessing remediation options and funding options under various state and federal grant, loan and tax reimbursement programs including Brownfield programs.

Selected Projects

- Brodson Property, Montville NJ, (RCRA, NJDEP ACO Cleanup)
- Carroll Gardens, Brooklyn, NY (NY Brownfield, EPA Superfund, OER E-designated Site)
- Con Edison Appendix B Spill Sites - Various Locations, NY
- Former MGP Site, Brooklyn, NY (VCP Site)
- Extell Development, Hudson Yards, New York, NY (NYC E-designated, NYS Brownfield Site)
- Pan Graphics, Bergen County, NJ (ISRA, LSRP)
- New Jersey Turnpike General Environmental Services Contract, Various Sites, NJ
- Liberty Science Center, Jersey City, NJ (EO 215)
- Blue Back Square, West Hartford, CT (UST, Transfer Act, Brownfield)
- Hershey, Act II Investigation (PA VCP)
- Hershey, Naugatuck, CT (CT Transfer Act)
- Halby Chemical Sites, Various Sites, DE (CERCLA)
- Unisys, Middletown CT, (CT Transfer Act, Brownfield)
- Ryder Rental, Various Sites in CT (CT Transfer Act)
- St. Marks Avenue, Brooklyn, NY (Vapor Mitigation)
- Pan Graphics, Lodi, NJ (Eco Risk Assessment, LSRP)

Education

M.S., Geology
Montclair State University

M.A., Environmental Science
Montclair University

B.S., Environmental Science
Cook College, Rutgers University

Professional Registration

Professional Geologist (PG) in NY, DE, KY

Licensed Environmental Professional (LEP) in CT

Underground Storage Tank License in NJ

Affiliations

National Ground Water Association

Association of Ground Water Scientists and Engineers

American Association of Petroleum Geologists

Environmental Professionals of Connecticut

American Bar Association (ABA)

LANGAN

LAUREN KOTT, PE

SENIOR STAFF ENGINEER

ENVIRONMENTAL ENGINEERING, REMEDIAL INVESTIGATION

Ms. Kott has 9 years of experience working on environmental projects, particularly investigation and remediation of environmental contamination. She has participated in multiple phases of site remediation including site investigation, remedial investigation, and remedial action. Her experience includes sample collection and characterization of various environmental media, and preparing reports and other environmental regulatory documents.

SELECTED PROJECTS

- Passaic Gifted and Talented Academy School No 20, Passaic, NJ*
- Former GM Plant and Redevelopment, Ewing, NJ*
- The Chelsea at Greenburgh, White Plains, NY*
- Brightview Devon, Wayne, PA*
- Residential Property, New Paltz, NY*
- Former Industrial Property, Bayonne, NJ*
- Childcare Facility, Jersey City, NJ*
- Allied Concrete, Rockaway, NJ*
- Mountain Creek, Vernon, NJ*
- Frankford Firehouse, Branchville, NJ*
- Venue at Longview, Plumsted Township, NJ*
- Venue at Smithville Greene, Eastampton, NJ*
- The Collection at Morristown, Morris Plains, NJ*
- Gables at Woodcliff Lake, Woodcliff Lake, NJ*
- Mountain Ridge Development, Mt. Olive, NJ*
- Brightview Port Jefferson, Port Jefferson, NY*
- Brightview Paramus, Paramus, NJ*
- Proposed Senior Living Facility, Rockville Centre, NY*

EDUCATION

B.E., Environmental Engineering
University of Delaware

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ

10-Hour Construction Safety

40-Hour HAZWOPER

** Denotes experience with previous firm*

MARLENA JEWETT

DATA ANALYST

CAD/GIS

1 year in the industry

Proposed Title: Field Technician

Ms. Jewett is a data analyst with experience in database design, management and visualization using EarthSoft's EQuIS™ database in support of environmental site characterizations for sites regulated under federal and state compliance programs. Her expertise includes integration of analytical databases and coordination with GIS users.

In her current role Marlena assists project teams with planning and implementation of project databases and data visualization. This includes coordinating with field staff and laboratories to define, workflows, SOPs and ensure the receipt of the proper deliverables for field and lab data; reviewing and managing project data and information using EQuIS™, Microsoft® Access, and Excel; generating data reports including tables, graphs, charts, and GIS compatible files; and generating and reviewing electronic data deliverables following project or agency specific formats.

Education

B.A., Environmental Economics
Colgate University

Work History

Equitable Advisors
Financial Advisor
9/7/2020-4/23/2021

Langan
Data Analyst
5/10/2021 – Present

SELECTED PROJECTS

EQuIS Management and NYSDEC deliverables – Data Analyst. Loaded and maintained soil, groundwater, and soil vapor data in an EQuIS database for a remedial investigation and waste characterizations of New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), NYC Office of Environmental Remediation (OER), and due diligence sites. Provided final report deliverables including sample summaries; tags; and exceedance summary exports from EQuIS. Completed this work for the following projects:

- **2-8 Main Street**
- **28-90 Review Avenue**
- **34-15 10th Street**
- **37-11 30th Street**
- **44-01 Northern Boulevard**
- **45 Commercial Avenue**
- **50 Jersey Avenue**
- **111 Willow Street**
- **118 West 13th Street**
- **122 Fifth Avenue**
- **155 Third Street**
- **160 East 125th Street**
- **210 Clarkson Avenue**
- **241 West 28th Street**
- **266 West 96th Street**
- **445 Gerard Avenue**
- **475 Bay Street and 31 Wave Street**

MARLENA JEWETT– FIELD TECHNICIAN

- **495 Peninsula Boulevard**
- **561 Greenwich Street**
- **563 Sackett Street**
- **805-825 Atlantic Avenue**
- **1525 Bedford Avenue**
- **2455 Third Avenue**
- **4650 Broadway**
- **ABC Block 27**
- **Bay Crane**
- **Broome Street**
- **Former Grant Hardware**
- **Forsyth and Delancy Street**
- **Gowanus Canal Northside**
- **Greenpoint Landing E1**
- **Greenpoint Landing Parcel H3**
- **John Evans**
- **Kissena Boulevard**
- **NYCHA Farragut**
- **Remeeder**

JOSEPH CONBOY

STAFF CHEMIST

ENVIRONMNETAL

Mr. Conboy has seven years of environmental chemistry, quality assurance, and environmental database management experience, with a current emphasis on validation of laboratory data for submittal to NJDEP via the New Jersey Data of Known Quality Protocols and to NYSDEC. Previous work experience includes performing validation of data for projects in USEPA Regions 2 and 3 while employing appropriate validation guidelines for each region, managing large data sets, updating appropriate regulatory limits, performing statistical evaluations, and preparing electronic data deliverables and report deliverables using the Earthsoft EQuIS database program, and acted as an intermediary between project managers, field staff, and laboratories. Mr. Conboy also has experience in field sampling techniques and maintains current OSHA HAZWOPER certification.

SELECTED PROJECTS

- 1400 Ferris, Bronx, NY – Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs and SVOCs including 1,4-dioxane, and tangentially used based on professional judgment to perform validation of PFAS data.
- Broome Street Parking Lot, NY - Completed validation of waste characterization data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs, SVOCs, herbicides, PCBs, pesticides, metals including mercury, ignitability temperature, pH, reactive cyanide, reactive sulfide, cyanide, and hexavalent chromium. Toxicity characteristic leachate procedure extraction data for VOCs, SVOCs, herbicides, pesticides, metals, and mercury were also validated.
- 215 North 10th Street, Brooklyn, NY - Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data.
- 35 Commercial Street, Brooklyn, NY - Completed validation of soil data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.
- Suffolk Street, Lower East Side, NY- Completed validation of soil, groundwater, and soil vapor data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II

EDUCATION

B.Sc., Chemistry with a minor in Mathematics
Rowan University

CERTIFICATIONS & TRAINING

OSHA 40-Hour HAZWOPER 29 CFR 1910.120(e)(4) Certification

NJ Analytical Guidance and Data Usability Training

USEPA Data Validation Training

Earthsoft EQuIS Environmental Database Training

guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, VOCs by USEPA TO-15, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.

- Managed a database for a confidential client containing 10+ years of environmental chemical data from multiple laboratories, requiring select data validation in accordance with New Jersey Data of Known Quality Protocols and identifying areas of delineation from historic field information. Once identified, NJDEP designated groundwater, surface water, soil, sediment, soil vapor, and custom screening criteria were researched and applied to each area, requiring individualized flagging for reporting.*
- Prepared the New Jersey Data of Known Quality Protocol Data Usability Evaluation and managed the database for a confidential client for a data set greater than 20 years old. A DUE or any validation effort was not prepared in the 20 years prior to current. This included data from variations of methods for volatile organic compounds, semivolatile organic compounds, total and dissolved metals, pesticides, herbicides, natural attenuation parameters, and per- and polyfluoroalkyl substances in multiple media.*
- Performed 200+ Stage 2a validations for a combined 87-acre USEPA designated Corrective Action site under the Resource Conservation and Recovery Act, including a quick-turn USEPA required PCB by soxhlet extraction investigation across multiple plants. Once a former train car painting facility, USEPA required a quick-turn PCB by soxhlet extraction soil investigation.
- Preparation of a quality assurance program for a confidential client in West Virginia. A quick turn QAPP was prepared in a service location new to the consultant, resulting in research into state requirements for data usability and auditing newly employed laboratories. The QAPP was understood to be prepared for groundwater only, but the client did not reveal the need for sediment and soil. Two QAPPs were submitted for review to governing agencies.*
- Used statistical software to determine a localized background upper confidence limit of chromium for a confidential client's sand and gravel site. Validation was used to confirm laboratory procedures, and data was used in ProUCL calculations to compare to researched background chromium levels for Pennsylvania soils. *
- Prepared daily perimeter dust and air monitoring summaries and validation of low level mirex data for a confidential client's superfund site. Low level mirex data was generated by university laboratories and subject to validation following national functional guidelines to aide in river clean-up, including sediment, surface water, and treatment system water matrices.*

**Project completed prior to employment at LANGAN.*

APPENDIX H

Citizen Participation Plan

LANGAN

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
130 Saint Felix Street Site
August 2020

C224306
130 Saint Felix Street
Brooklyn, New York 11217

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* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **130 St. Felix Street LLC ("Applicant")**
Site Name: **130 Saint Felix Street Site ("Site")**
Site Address: **130 Saint Felix Street, Brooklyn, NY**
Site County: **Kings County**
Site Number: **C224306**

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at:
http://www.dec.ny.gov/chemical/8450.html .

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment

- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process

- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community

- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web-site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.
The site contact list includes, at a minimum:

- Chief executive officer and planning board chairperson of each county, city, town and village in which the site is located;
- Residents, owners, and occupants of the site and properties adjacent to the site;
- The public water supplier which services the area in which the site is located;
- Any person who has requested to be placed on the site contact list;
- The administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility;
- Location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See http://www.dec.ny.gov/chemical/61092.html.

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The

flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, the significant threat determination for the site had not yet been made.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repository(ies)	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.

Citizen Participation Activities	Timing of CP Activity(ies)
Before Applicant Starts Cl eanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

Based on the investigations conducted to date, the primary contaminants of concern are industrial levels of semi-volatile organic compounds (SVOCs) from coal and ash and heavy metals in soil and groundwater. Therefore, there will be areas on the Site where soil excavation is necessary. Therefore, once the remediation commences, there may be concerns regarding odors, noise or truck traffic coming from the Site. However, these impacts will be mitigated through implementation of a Health and Safety Plan (HASP) and Soil Management Plan approved by the Department, which will be designed to minimize these impacts. A Community Air Monitoring Plan (CAMP) will also be implemented to monitor dust and vapors to ensure the community is not impacted. CAMP implementation involves the placement of air monitoring stations downwind of where work is occurring to capture both dust and vapor emissions. If dust or emissions exceed a set threshold established by DEC and the Department of Health, then work must cease and the cause of the issue must be corrected before work can proceed.

The site is located in an Environmental Justice Area. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities.

The site is located in an area with a large African-American population nearby. Therefore, there is no need to translate future fact sheets into another language. For additional information, visit: https://popfactfinder.planning.nyc.gov/profile/899/census

In addition, there may be issues with regards to noise, odor, or truck-related traffic. However, these issues will be controlled as discussed above through the implementation of the HASP and CAMP.

4. Site Information

Appendix C contains a map identifying the location of the site.

Site Description

- **130 Saint Felix Street, Kings County, Brooklyn, Ny**
- **setting - urban, suburban**
- **site size – 0.288 Acres**
- **adjacent properties – Residential and Commercial**

History of Site Use, Investigation, and Cleanup

The Subject Property has been used as a parking lot since at least 1950. However, prior to the parking lot use, the City Department of Finance classification of the Subject Property was as a garage/gasoline station. Therefore, according to the Phase I, auto repair or service activities may have taken place on the Subject Property, which was determined to be a Recognized Environmental Condition (REC) in the Phase I site investigation. There were observed areas where concrete and asphalt were cut and later patched suggesting Underground Storage Tanks (USTs) were either removed or are still present. Potential releases of petroleum products, solvents, and/or other hazardous materials from adjacent properties may have adversely impacted soil, groundwater, and/or soil vapor at the Subject Property. There were also several dry cleaners in the vicinity of the Site located less than 900 feet away and a spill of No. 2 fuel oil at the adjacent site.

A subsurface investigation was performed in May-June 2015 which included: 1) installation of 5 soil borings and collection of six soil samples, 2) installation of one groundwater monitoring well and collection of two groundwater samples, and 3) collection of three soil vapor samples and one ambient air sample. A contaminated fill layer was observed extending down to depths of approximately 9.5 feet consisting of varying amounts of brick, concrete, slag, coal, tile, glass, gravel, and silt. The site investigation to date has revealed there are high semi-volatile organic compounds and metals present from the coal, ash and slag in the fill soils, which will require remediation. In groundwater, the chloroform exceeded its respective Ambient Water Quality Standard (AWQS), and total metal concentrations of trivalent chromium, iron, and sodium were detected above AWQS in unfiltered samples. Only sodium was still present above the AWQS in a dissolved (filtered) metals sample. Finally, there are multiple volatile organic compounds (VOCs) in soil vapor, predominantly originating from petroleum-related compounds (i.e., benzene, trimethylbenzenes, xylenes, and toluene, etc.) at concentrations above baseline levels located near the north-central

area of the Site but there are no soil vapor NYSDOH Air Guidance Values (AGVs) for most of the Chlorinated Volatile Organic Compounds (CVOCs) detected.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in its Application proposes that the site will be used for unrestricted purposes.

To achieve this goal, the Applicant will conduct investigation activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Investigation

The Applicant will conduct an investigation of the site officially called a "remedial investigation" (RI). This investigation will be performed with NYSDEC oversight. The Applicant must develop a remedial investigation workplan, which is subject to public comment.

The site investigation has several goals:

1) Define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;
2) Identify the source(s) of the contamination;
3) Assess the impact of the contamination on public health and the environment; and
4) Provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant submits a draft "Remedial Investigation Work Plan" to NYSDEC for

review and approval. NYSDEC makes the draft plan available to the public review during a 30-day public comment period.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report also will recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a “significant threat,” it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a “Certificate of Completion” (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a “Remedial Work Plan”. The Remedial Work Plan describes the Applicant’s proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would

announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the Final Engineering Report (FER). NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved, and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A -
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Shaun Bollers
Project Manager
NYSDEC
Division of Environmental Remediation
One Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101
Shaun.bollers@dec.ny.gov

New York State Department of Health (NYSDOH):

Scarlett McLaughlin, P.G.
Chief, Regions 2 and 7
New York State Department of Health
Bureau of Environmental Exposure
Investigation
Empire State Plaza - Corning Tower
Room 1739
Albany, NY 12237
Phone: (518) 402-7860
beei@health.ny.gov

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Brooklyn Public Library-Pacific Branch
25 Fourth Avenue
Brooklyn, NY 11217
Candace Vasquez, Managing Librarian
Phone: (718) 638-1531

Brooklyn Community Board No. 2
350 Jay Street, 8th Floor
Brooklyn, NY 11201
Shirley McRae, Chairwoman
(718) 596-5410

Repositories are temporarily unavailable due to COVID-19 precautions. If you cannot access the online repository at https://gisservices.dec.ny.gov/gis/dil/, please contact the NYSDEC project manager listed above for assistance. Project informational materials will also be posted to the Project website, which is -**www.stfelixmusicandliving.com.**

Appendix B - Site Contact List

Federal and State Officials		
Hon. Chuck E. Schumer U.S. Senate 780 Third Avenue, Suite 2301 New York, NY 10017	Hon. Kirsten Gillibrand U.S. Senate 780 Third Avenue, Suite 2601 New York, NY 10017	Hon. Hakeem Jeffries U.S. House of Representatives-8th Congressional District 55 Hanson Place, Suite 603 Brooklyn, NY 11217
Hon. Velmanette Montgomery New York State Senator-25th NY Senate District 30 Third Avenue, Suite 207 Brooklyn, NY 11217	Nancy T. Sunshine Kings County Clerk 360 Adams Street, Room 189 Brooklyn, NY 11201	Hon. Eric Adams Kings County Executive (Borough President) 209 Joralemon Street Brooklyn, NY 11201
Marisa Lago NYC Planning Commissioner 120 Broadway, 31st Floor New York, NY 10271	Hon. Bill de Blasio Mayor of NYC City Hall New York, NY 10007	Mark McIntyre, Director NYC Office of Environmental Remediation 100 Gold Street - 2nd Floor New York, NY 10038
Hon. Councilwoman Laurie Cumbo 55 Hanson Pl, Suite 778 Brooklyn, NY 11217	Assemblymember Walter T. Mosley, Assembly District 57 55 Hanson Place Brooklyn, NY 11217	Julie Stein Office of Environmental Assessment & Planning NYC Dept. of Environmental Protection 96-05 Horace Harding Expressway Flushing, NY 11373

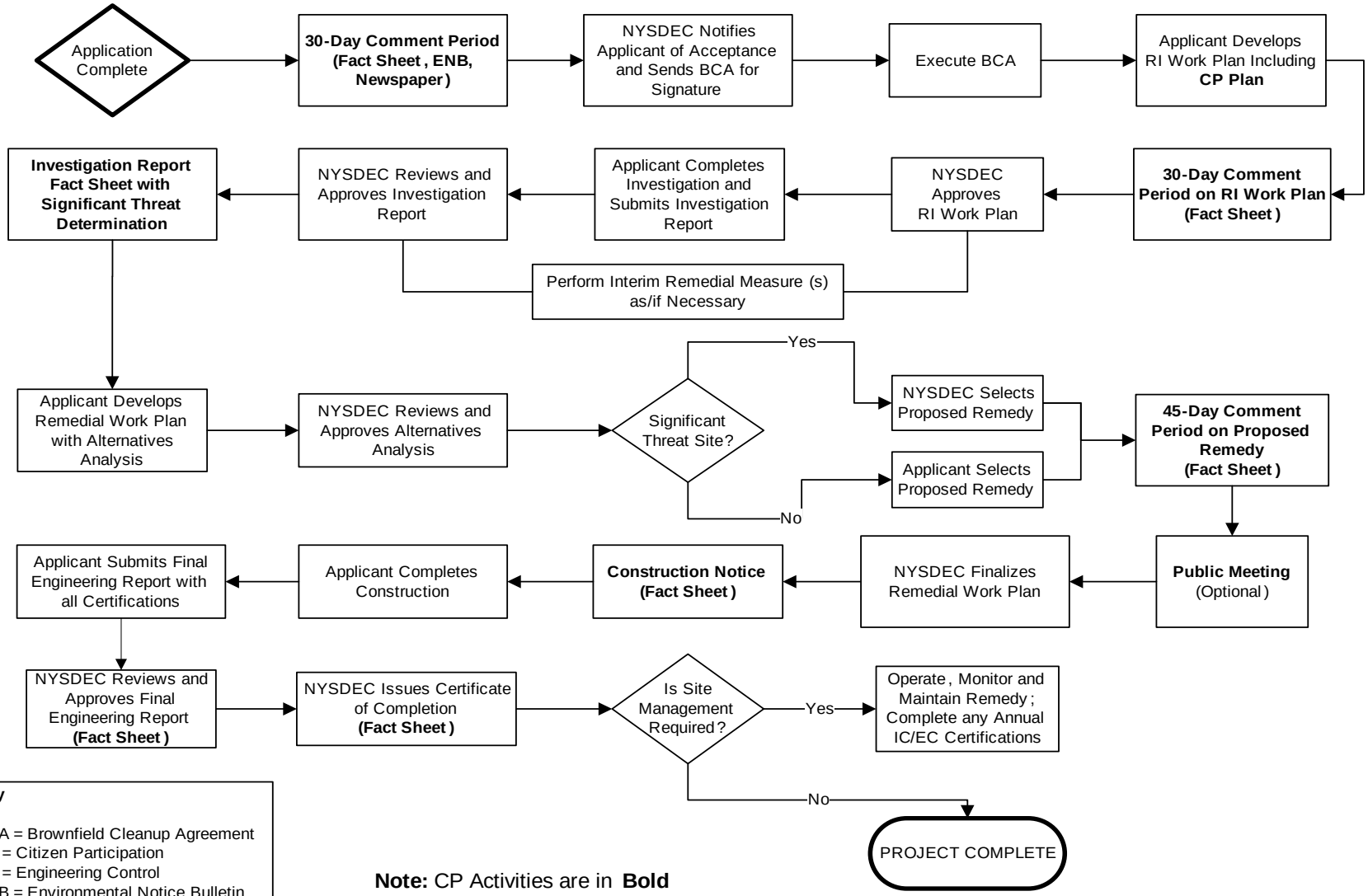
NYC Dept. of Environmental Protection 96-05 Horace Harding Expressway Flushing, NY 11373		
Media Outlets		
New York Daily News Media Outlet 4 New York Plaza New York, NY 10004	Brooklyn Daily Eagle 16 Court Street, 30th Floor Brooklyn, NY 11241	Brooklyn Paper One Metrotech Center, 3rd Floor Brooklyn, NY 11201
Spectrum NY 1 News 75 Ninth Avenue New York, NY 10011	Courier-Life Publications 1 Metrotech Center #10T Brooklyn, NY 11201	New York Post 1211 Avenue of the Americas New York, NY 10036
Public Water Supplier		
Vincent Sapienza New York City Department of Environmental Protection 59-17 Junction Blvd. Flushing, NY 11373	Alfonso Carney Chair of New York City Water Board 59-17 Junction Blvd. Flushing, NY 11373	
Schools and Daycare Facilities		
Pauline Evans Principal of Hanson Place Elementary School 38 Lafayette Avenue Brooklyn, NY 11217	Daniel A. Vecchiano Principal of Brooklyn High School of the Arts 345 Dean Street Brooklyn, NY 11217	Atiyya Abdur-Rahman Community School Director of Public School 38-The Pacific School 450 Pacific Street Brooklyn, NY 11217
Hanson Place Child Development Center, Inc. 55 Hanson Place Brooklyn, NY 11217	Metropolitan Corp. Academy 362 Schermerhorn St. Brooklyn, NY 11217	Marjorie Dalrymple Principal of P369K: The Coy L. Cox School 383 State Street Brooklyn, NY 11217
David Newman Principal of Brooklyn Technical High School 29 Fort Greene Place Brooklyn, NY 11217	Jennifer Wilkin Head of School for the Science Language & Art International School 9 Hanover Place Brooklyn, NY 11201	Victoria Olson Owner of Kids Run Around Daycare 615 Warren Street Brooklyn, NY 11217

Lorraine Pennisi Executive Director of Strong Place for Hope Daycare 460 Atlantic Avenue Brooklyn, NY 11217	Yvonne Robinson Program Director of Hanover Place Child Care, LLC 15 Hanover Place Brooklyn, NY 11201	Acorn High School for Social Justice 500 Pacific Street Brooklyn, NY 11217
Northside Center for Child Development 44-60 Rockwell Place Brooklyn, NY 11217	P369K: The Coy L Cox School 383 State Street Brooklyn, NY 11217	
Adjacent Property Owners		
20 Lafayette LLC Adjacent Property Owner of 286 Ashland Place 45 Main Street, Suite 1200 Brooklyn, NY 11201	The City of New York Adjacent Property Owner of 321 Ashland Place City Hall New York, NY 10038	Brooklyn Music School Adjacent Property Owner/Operator of 126 Saint Felix Street 126 Saint Felix Street Brooklyn, NY 11217
Maria-Lisa Lydon Adjacent Property Owner of 123 Saint Felix Street 123 Saint Felix Street Brooklyn, NY 11217	Cynthia J. Wilson Adjacent Property Owner of 125 Saint Felix Street 23 Hampton Place Brooklyn, NY 10304	127 Saint Felix Street, LLC Adjacent Property Owner of 127 Saint Felix Street 7702 Blue Lilly Drive Austin, TX 78759
Spencer Scott and Heidi Prieur Adjacent Property Owner of 129 Saint Felix Street 593 Presidents Street, #3L Brooklyn, NY 11215	Keenan Choy and Bree Choy Adjacent Property Owner of 131 Saint Felix Street 305 Broadway, Suite 802 New York, NY 10007	George Wong and Doreen Wong Adjacent Property Owner of 133 Saint Felix Street 80 Winthrop Street Brooklyn, NY 11225
Hanson Place Methodist Church Adjacent Property Owner/Operator of 144 Saint Felix Street 144 Saint Felix Street Brooklyn, NY 11217	CJUF II Hanson LLC Adjacent Property Owner of 1 Hanson Place 10 East 40th Street, 10th Floor New York, NY 10016	BAM Fisher Adjacent Property Operator of 321 Ashland Place 321 Ashland Place Brooklyn, NY 11217
The Board of Managers of One Hanson Place Condominium Attn: Kristofor Larsen, President One Hanson Place		

Brooklyn, NY 11243		
Community, Civic Religious and Other Environmental Organizations		
Hanson Place Seventh-Day Adventist Church 88 Hanson Pl Brooklyn, NY 11217	Fort Greene Association Box 170563 Brooklyn, NY 11217-0563 Attn: Paul Palazzo, Chair	Clinton Hill CSA Email: web@clintonhillcsa.org P.O. Box 050377 Brooklyn, NY 11205
Fort Greene Parks Conservancy 85 South Oxford Street Brooklyn, NY 11217 Email: info@fortegreenepark.org Attn: Charles Jarden, Chairman	Atlantic Avenue Local Development Corporation Atlantic Avenue LDC 494 Atlantic Avenue Brooklyn, NY 11217 Email: atlanticave@atlanticave.org Tel: (718) 875 8993 Attn: Tammy Ben-Eliezer-Baxter	

Appendix C - Site Location Map

Appendix D– Brownfield Cleanup Program Process



Key

BCA = Brownfield Cleanup Agreement
CP = Citizen Participation
EC = Engineering Control
ENB = Environmental Notice Bulletin
IC = Institutional Control
RI = Remedial Investigation

Note: CP Activities are in **Bold**

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern (see instructions)

Site Name: 130 Saint Felix Street Site

Site Number: C224306

Site Address and County: 130 Saint Felix Street, Kings County, Brooklyn, NY

Remedial Party(ies): 130 St. Felix Street LLC

Note: For Parts 1. – 3. the individuals, groups, organizations, businesses and units of government identified should be added to the site contact list as appropriate.

Part 1. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and information needs. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**
The list of potential impacts contained in the CPP are typical impacts of remediation on brownfield sites and include dust, noise and truck traffic.

How were these issues and/or information needs identified?
See response above.

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses and/or units of government related to the information needed.
Nothing is needed from the community at this time

How were these information needs identified?
NA

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.
Communication of each step in the BCP process must be communicated in Fact Sheets and public hearings if required. The volunteer has also created a project website in which BCP documents and project related documents will be made available at www.stfelixmusicandliving.com.

How were these issues and/or information needs identified?
This is part of the required BCP Citizen Participation process.

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning at and around site:
☒ **Residential** ☐ **Agricultural** ☐ **Recreational** ☐ **Commercial** ☐ **Industrial**

b. Residential type around site:

☒ **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:
☒ **High** ☐ **Medium** ☐ **Low**

d. Water supply of nearby residences:
☒ **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all of the water supply of the affected/interested community currently impacted by the site?
☐ **Yes** ☒ **No**

Provide details if appropriate:
Click here to enter text.

f. Other environmental issues significantly impacted/impacting the affected community?
☐ **Yes** ☒ **No**

Provide details if appropriate:
Click here to enter text.

g. Is the site and/or the affected/interested community wholly or partly in an Environmental Justice Area?
☒ **Yes** ☐ **No**

h. Special considerations:
☐ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain any marked categories in **h:**
Even though the site is in an EJ Area, the minority population is African American and therefore no language translation of the fact sheets is required.

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in Part 2. of the Citizen Participation Plan under 'Site Contact List'. Are *other* individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.)

☒ **Non-Adjacent Residents/Property Owners:** Click here to enter text.

☒ **Local Officials:** Click here to enter text.

☒ **Media:** Click here to enter text.

☒ **Business/Commercial Interests:** Click here to enter text.

☐ **Labor Group(s)/Employees:** Click here to enter text.

☐ **Indian Nation:** Click here to enter text.

☒ **Citizens/Community Group(s):** Click here to enter text.

☒ **Environmental Justice Group(s):** Click here to enter text.

☒ **Environmental Group(s):** Click here to enter text.

☒ **Civic Group(s):** Click here to enter text.

☐ **Recreational Group(s):** Click here to enter text.

☐ **Other(s):** Click here to enter text.

Prepared/Updated By: Linda R. Shaw, Esq. **Date:** 8/10/2020

Reviewed Approved By: Thomas V. Panzone **Date:** 8/11/2020

APPENDIX I

Remediation Schedule

Appendix I - Remedial Action Construction Schedule
130 St. Felix Street
Brooklyn, New York

Estimated Project Schedule

Item	Action	2025												2026					
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1	Implementation of RAWP with Engineering Oversight				■	■	■	■	■	■	■	■	■						
2	Preparation of an Environmental Easement, FER, and SMP											■	■	■					
3	NYSDEC & NYSDOH Review of FER (and SMP)														■	■	■	■	
4	NYSDEC Issues COC																		■

Notes:

a) This is an estimated schedule; all items are subject to change.
b) Completion of Item 1 refers to the completion of remediation and not the end of overall construction.
c) NYSDEC = New York State Department of Environmental Conservation
d) NYSDOH = New York State Department of Health
e) RAWP = Remedial Action Work Plan
f) FER = Final Engineering Report
g) SMP = Site Management Plan
h) COC = Certificate of Completion