FORMER BENNETT TRUCKING CORP.

KINGS COUNTY

BROOKLYN, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: C224181

Prepared for:

845 Grand Development LLC
211 Hayes Avenue, Unit 201
Monroe, NY 10950

Prepared by:

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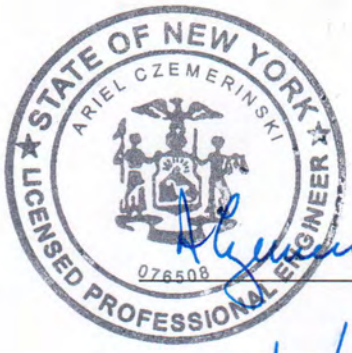
Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date
1	November 12, 2015	Engineered Cap Text and Figure Revisions	

NOVEMBER 2015

CERTIFICATION STATEMENT

I, Ariel Czemerinski, certify that I am currently a NYS registered professional engineer as in defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



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12/7/2015
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former Bennett Trucking Corp. SMP

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TABLES

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ATTACHMENTS

LIST OF ACRONYMS

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
GHG	Green House Gas
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operations and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Soil Management Plan
SOP	Standard Operating Procedures

SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
SVMS	Soil Vapor Mitigation System
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program

EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Id: C224181 - Former Bennett Trucking Corp.

Site Address: 845 Grand Street, Brooklyn, NY

Institutional Controls:	1. The property may be used for residential, restricted residential, commercial, and industrial uses;
	2. The remedial party or site owner must complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8(h)(3);
	3. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
	4. Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
	5. All ECs must be operated and maintained as specified in this SMP;
	6. All ECs must be inspected at a frequency and in a manner defined in the SMP.
	7. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
	8. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
	9. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
	10. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
	11. Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
Engineering Controls:	1. Cover system
	2. Soil Vapor Extraction System
	3. In-Situ Chemical Oxidation Treatment

Site Id: C224181 - Former Bennett Trucking Corp.

Site Address: 845 Grand Street, Brooklyn, NY

Inspections:	**Frequency**
1. Cover inspection	Annually
2. Soil Vapor Extraction System	Quarterly
Monitoring:	
1. Cover inspection	Annually
2. Soil Vapor Extraction System	Monthly
3. In-Situ Chemical Oxidation Treatment Monitoring Well Sampling	Quarterly and/or 1 month after injection
Maintenance:	
1. Soil Vapor Extraction System – Blower Maintenance	As needed
2. In-Situ Chemical Oxidation Treatment Injection well and Monitoring Well Maintenance	As needed
Reporting:	
1. Groundwater Data	Annually
2. SVE Discharge Monitoring	Annually
3. Periodic Review Report	Annually

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Former Bennett Trucking Corp. Site located in Brooklyn, New York (hereinafter referred to as the "Site"). See **Figure 1**. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP) Site No. C224181 which is administered by New York State Department of Environmental Conservation (NYSDEC).

845 Grand Development LLC entered into a Brownfield Cleanup Agreement (BCA), on January 31, 2014, with the NYSDEC to remediate the Site. A figure showing the site location and boundaries of this Site is provided in **Figures 1** and **2** respectively. The boundaries of the Site are more fully described in the Metes and Bounds site description that is part of the Environmental Easement provided in **Attachment C**.

After completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Kings County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the

Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA, (Index #C224181-11-13; Site #C224181) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in **Attachment A** of this SMP.

This SMP was prepared by AMC Engineering PLLC, on behalf of 845 Grand Development LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated July 2015, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the Site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6NYCRR Part 375 and/or Environmental Conservation Law.

- 7-day advance notice of any field activity associated with the remedial program.

- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.

- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Brownfield Cleanup Agreement (BCA), and all approved work plans and reports, including this SMP.

- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 provided below includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in **Attachment A**.

Table 1: Notifications*

Name	Contact Information
Larry Alden	518-402-9767, Larry.alden@dec.ny.gov
Jane O'Connell	718-482-4599, Jane.Oconnell@dec.ny.gov
Kelly Lewandowski	518-402-9581, Kelly.Lewandowski@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located in Brooklyn, Kings County, New York and is identified as Section 1900 Block 2922 and Lot 47 on the Brooklyn Tax Map (**Figure 1**). The Site is an approximately 0.19-acre area and is bounded by a 7-story apartment building (Block 2922, Lot 3 – 75 Bushwick Avenue) with a parking area to the north and west, a three-story apartment building with a 1st floor store (Block 2292, lot 46 – 855 Grand Street) to the east, and Grand Street to the south, (see **Figure 2** – Site Layout Map). The boundaries of the Site are more fully described in **Attachment** C – Environmental Easement. The owner of the site parcel at the time of issuance of this SMP is 845 Grand Development LLC.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of a new 6-story apartment building with a cellar and a cellar level rear recreation area. The Site is zoned R7A with a C2-4 commercial overlay. The new apartment building is currently nearing completion, and is not yet occupied.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include residential properties, some with first floor stores. The adjacent property to the north and west is developed with a 96 unit, 7-story apartment building with an off-street parking lot. A large public school is located to the south on the opposite side of Grand Street, and most properties along Grand Street to the east are developed with apartment buildings with first floor stores.

2.2.2 Geology

Subsurface soil at the Site consists of a native brown silty-sand to the water table (approximately 30 feet below grade). Site specific boring logs are provided in **Attachment D**.

2.2.3 Hydrogeology

The depth to groundwater at the Site as determined during the Remedial Investigation varied between 30.06 ft and 31.41 feet below grade. Monitoring wells installed as part of the Remedial

Investigation were surveyed to determine groundwater flow is generally from the north-north east to south-southwest at the Site (**Figure 3**). Following remedial activities, four new monitoring wells (14MW1, 14MW2, 14MW3 and 14MW4) were installed at the Site to determine the effectiveness of the chemical oxidant injection program. Monitoring well 14MW4 is located in the rear courtyard and monitoring wells 14MW1, 14MW2 and 14MW3 are located within the sidewalk immediately down gradient of the former petroleum source area (**Figure 8**). Groundwater monitoring well construction logs are provided in **Attachment D**.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

2.3.1 Phase I Environmental Site Assessment Report (EBC, February 2013)

The Phase I Report identified the following Site history: The Site was an undeveloped portion of a larger residential property from at least 1888 through 1907. By 1928, the Site was developed with a garage, later occupied by a motor freight company. The 1933 through 1967 Sanborn maps showed an underground gasoline tank within the building. By 1977, the building was used as a warehouse and for other non-specific commercial uses, with tenants including a sanitation company and a coffee distributor. In the late 2000's, the building was converted into a laundromat, dry cleaning drop off facility, and a retail store.

2.3.2 Limited Phase II Subsurface Investigation (EBC, June 2013 and October 2013)

EBC performed a Phase II Subsurface Investigation based on the recommendations made in the Phase I Report. The Phase II performed in June 2013 consisted of the installation of two soil borings near the approximate location of the underground gasoline storage tank(s) depicted on the Sanborn maps. Soil samples retained from the borings exhibited PID readings ranging from non-detect to 10 ppm. Elevated concentrations of gasoline related volatile organic compounds were detected with the soil samples. NYSDEC Spill Number 1303007 was assigned to the Site.

EBC installed on temporary monitoring well in October 2013 in the area of the underground gasoline tank. Elevated concentrations of gasoline related volatile organic compounds were detected with the groundwater sample.

2.3.3 Remedial Investigation Report (EBC, October 2014)

The Remedial Investigation was performed following acceptance into the NYSDEC BCP and in accordance with the approved Remedial Investigation Work Plan (RIWP). The Remedial Investigation consisted of the collection and laboratory analysis of soil, groundwater and soil gas samples.

A total of 9 soil borings (SB1 through SB9) were performed to identify source areas and to obtain general soil quality information at the Site. Gasoline related volatile organic compounds were detected above Unrestricted Use SCOs and Restricted Residential Use SCOs (1,2,4-trimethylbenzene in SB6) within the soil sample retained from immediately above the groundwater table (26 to 27ft) from soil boring SB6. Gasoline related VOCs were also detected above Unrestricted Use SCOs within soil sample SB9 (15ft). Soil borings SB6 and SB9 were performed in the approximate area of the underground gasoline tank.

In accordance with the RIWP, three groundwater monitoring wells (MW1, MW3 and MW5) were installed. Proposed monitoring wells MW2 and MW4 were not installed due to repeated refusal. Gasoline related VOCs were detected above GQS in two of the three monitoring wells (MW3 and MW5). Total VOC concentrations ranged from 125 µg/L (MW1) to 6,046 µg/L (MW5). The concentrations of petroleum related VOCs within groundwater were highest at the most up gradient well location, MW5, as well as immediately down gradient of the source area, GW1. The chlorinated VOCs cis-1,2-dichloroethene and trichloroethene were detected in one or more of the groundwater sampling locations, but all at a concentration below GQS. The SVOCs benzo(a)anthracene and chrysene were detected in part per trillion concentrations within all three monitoring wells and are likely attributable to background conditions.

To assess the presence of VOCs in soil vapor beneath the site, six soil vapor samples (SG1-SG6) were collected at the site from a depth of approximately 12 feet below grade. Multiple VOCs were detected above the laboratory method detection limit in each of the six soil gas samples. BTEX concentrations were generally low across the Site ranging in concentration from 4.65

µg/m^3 in SG1 to 1,243.8 µg/m^3 in SG6. The highest concentrations of BTEX compounds were detected in the southeast corner of the property. There is no correlation between the identified source area and petroleum VOCs in soil gas as some of the lowest concentrations reported were in SG4 located adjacent to the source area.

Chlorinated VOCs (CVOCs) were reported in all soil gas samples at concentration below NYSDOH Guidance Values, with the exception of trichloroethene (TCE) which was detected at a concentration of 14.8 µg/m^3 in sample SG4, located in the south central area of the Site.

Conceptual Model of Site Contamination

VOC contamination in soil consists of petroleum (gasoline) related contaminants on the southern portion of the property, within the parking area of the former commercial building and in the vicinity of a former underground gasoline tank. Soil impacts in this area extend from approximately 13 feet below grade to the water table at approximately 30 ft below grade.

Since the gasoline related VOCs were reported at depths ranging from 13 to 27 feet below grade in the vicinity of the underground gasoline tank, the contamination is likely associated with a release from the gasoline tank or associated piping/dispenser. The volume of the spill at this location was sufficient to allow vertical migration through a 15 foot of soil column to the water table at a depth of 30 feet below grade creating a lens of residually impacted soil. This zone of impacted soil acted as a source of contamination to the groundwater which migrated in the direction of groundwater flow.

The direction of groundwater flow is to the southwest. This flow direction would not account for groundwater impacts identified in MW5 which is located in the northeast corner of the property. Using the current groundwater flow direction, MW5 is positioned up gradient of the source area. Since it is likely that the release occurred many years ago, it is possible that the flow direction was originally to the northeast and then at some point reversed direction to the southwest. The English Kills waterway is located approximately 2,000 feet to the east of the Site and flows north. The L-train line of the New York City subway system runs just west of the Site along Bushwick Avenue. This line has a subway stop at the intersection of Grand Street and Bushwick Avenue southeast of the Site. It is therefore possible that groundwater flow in the 50's and 60's was northeast toward the English Kills. If dewatering operations were initiated at the L-train

subway stop at some point this could be responsible for a local groundwater reversal. It is also possible that the petroleum impact at MW5 is related to an off-Site up gradient source; however, no such potential source has been identified.

No significant off-gassing is occurring on-Site from the source area as is evident by the perimeter and interior soil vapor sampling results. This is likely due to the age of the release.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated January 30, 2015 are as follows:

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.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

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

Soil Vapor

RAOs for Public Health Protection

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

2.5 Remaining Contamination

2.5.1 Soil

The entire Site was excavated to a depth of approximately 12 feet below grade, and additional excavation to a depth of approximately 15 feet below grade was performed in the source area. Endpoint soil samples collected following excavation indicate soil across the Site to a depth of 15 feet below grade meets Track 1 Unrestricted Use SCOs.

However, soil sampling conducted during the Remedial Investigation identified gasoline related volatile organic compounds above Unrestricted Use SCOs and Restricted Residential Use SCOs (1,2,4-trimethylbenzene in SB6) within soil immediately above the groundwater table in the source area. The source area is approximately 460 sf and limited to the southern end of the lot, in the area of the former UST. The contaminated soil area is limited to an approximately 15 foot wide soil column that extends to the water table (30 feet below grade). This zone of impacted soil acted as a source of contamination to the groundwater which migrated in the direction of groundwater flow. The area of impacted soil is estimated based upon sampling results as well as boring logs/field observations during previous investigations (absence of odor, staining and/or PID readings). The gasoline related volatile organic compounds detected above Unrestricted Use SCOs and Restricted Residential Use SCOs within the soil samples collected from the source area immediately above the groundwater table are provided in **Table 2** below.

Table 2. Remaining Soil Sample Exceedances

COMPOUND	NYSDEC Part 375.6 Unrestricted Use Soil Cleanup Objectives	NYDEC Part 375.6 Restricted Residential Soil Cleanup Objectives*	SB6	
			3/18/2014 (25-26') µg/Kg Result	3/18/2014 (26-27') µg/Kg Result
1,2,4-Trimethylbenzene	3,600	52,000	**19,000**	**56,000**
1,3,5-Trimethylbenzene	8,400	52,000	**-**	**24,000**
Benzene	60	4,800	**100**	**430**
Ethylbenzene	1,000	41,000	**3,300**	**24,000**
m&p-Xylenes	260	100,000	**6,900**	**53,000**
Methylene chloride	50	100,000	**-**	**610**
Naphthalene	12,000	100,000	**-**	**12,000**
n-Propylbenzene	3,900	100,000	**-**	**15,000**
o-Xylene	260	100,000	**560**	**12,000**

Figure 4 summarizes the results of all soil samples collected that exceed the Unrestricted Use SCOs and Restricted Residential Use SCOs at the Site after completion of remedial action. Based on Remedial Investigation data (pre-remediation conditions), petroleum contaminated soil may be present at depths greater than 2 feet below the new building slab down to the water table.

However, petroleum contaminated soil in the source area from 15 feet below grade down to the water table is being remediated utilizing a soil vapor extraction system.

2.5.3 Groundwater

Remediation of dissolved phase VOCs in groundwater is being accomplished through a chemical oxidant injection program. The area of injection is within and up gradient of the source area. Injections at these locations deliver oxidant to the subsurface allowing it to flow southwest with groundwater, treating both residual contaminants in soil and the groundwater. The chemical oxidant injection program utilizes eight new injections wells (IW1-IW8) for oxidant application. The injection wells are located within and up gradient of the source area as shown on **Figure 8**.

A chemical oxidant injection event was performed on September 13, 2015. The oxidant injection consisted of 100 gallons of a 10 to 30 percent solution of sodium persulfate and chelated iron activator injected into each of the eight injection wells. The chelated iron activator was added at a ratio of 9 lbs of FeEDTA powder to each 55 lb bag of sodium persulfate.

Four monitoring wells (14MW1, 14MW2, 14MW3 and 14MW4) were installed at the Site to determine the effectiveness of the chemical oxidant injection program. Monitoring well 14MW4 is located in the rear courtyard and monitoring wells 14MW1, 14MW2 and 14MW3 are located within the sidewalk immediately down gradient of the former petroleum source area (**Figure 8**).

Groundwater samples were collected from each of the four monitoring wells on October 7, 2015, for laboratory analysis of VOCs by EPA Method 8260, SVOCs by EPA Method 8270, and Persulfate.

No petroleum related VOCs were detected within the groundwater samples collected from the three sidewalk monitoring wells with the exception of methyl t-butyl ether (MTBE) which was detected within 14MW1 (0.74 µg/L) and 14MW2 (0.39 µg/L) at concentrations below GQS. The chlorinated VOC tetrachloroethene (PCE) was detected above GQS within 14MW1 and 14MW3.

The following petroleum VOCs were detected above GQS within the 14MW4 and/or 14MW4 duplicate groundwater sample: 1,3,5-trimethylbenzene (maximum of 23 µg/L), benzene (maximum of 1.1 µg/L), ethylbenzene (30 µg/L), m&p-xylenes (maximum of 58 µg/L), n-propylbenzene (maximum of 11 µg/L), o-xylene (maximum of 14 µg/L), and toluene (maximum of 6.1 µg/L). The total petroleum VOC concentration was 96.6 µg/L for 14MW4 and 122.5 µg/L for the 14MW4 duplicate. No CVOCs were detected above GQS within 14MW4 or the duplicate. Groundwater exceedances are listed in **Table 3** below.

Table 3. Remaining Groundwater Sample Exceedances

Compound	NYSDEC Groundwater Quality Standards	14MW1 10/7/2015	14MW2 10/7/2015	14MW3 10/7/2015	14MW4 10/7/2015	Duplicate 14MW4 10/7/2015
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1,3,5-Trimethylbenzene	5	-	-	-	-	**23**
Benzene	1					**1.1**
Ethylbenzene	5					**30**
m&p-Xylenes	5	-	-	-	**58**	**37**
n-Propylbenzene	5	-	-	-	**11**	**10**
o-Xylene	5	-	-	-	**14**	**10**
Tetrachloroethene	5	**5.2**	-	**5.4**	-	-
Toluene	5	-	-	-	**5.1**	**6.1**

Figure 5 summarizes the results of all samples of groundwater that exceed the GQS.

2.5.5 Soil Vapor

Soil vapor sampling performed during the Remedial Investigation noted BTEX concentrations (benzene, toluene, ethylbenzene, and xylenes) were generally moderate across the Site ranging in concentration from 4.65 µg/m^3 to 1,243.8 µg/m^3 in SG6. Chlorinated VOCs (CVOCs) were reported in all soil gas samples at concentrations below NYSDOH Guidance Values, with the exception of trichloroethene (TCE) which was detected at a concentration of 14.8 µg/m^3 in sample SG4, located in the center of the Site. No trichloroethylene was detected within any of the soil samples collected at the Site, so the trichloroethylene exceedance is likely associated with an off-Site source.

Figure 6 lists all compounds detected within soil vapor during the RI.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the Site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in **Attachment B**) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the Site to Restricted Residential, Commercial and Industrial uses only. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on **Figure 9**. These ICs are:

1. The remedial party or site owner must complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8(h)(3);
2. The property may be used for residential, restricted residential, commercial, and industrial uses; The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
3. Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
4. All ECs must be operated and maintained as specified in this SMP;
5. All ECs must be inspected at a frequency and in a manner defined in the SMP.
6. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
7. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
8. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
9. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
10. Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
11. Vegetable gardens and farming on the site are prohibited.

3.3 Engineering Controls

3.3.1 Cover

Petroleum contaminated soil is present at a depth of approximately 2 feet below the cellar slab. Exposure to remaining contamination at the Site is prevented by a cover system placed over the Site. This cover system is comprised of a minimum of a 4 inch thick concrete slab in the cellar, 2 inch thick 24” by 24” concrete pavers covering the cellar level rear courtyard, and a minimum of

2 feet of certified clean soil covering the at-grade area surrounding the rear cellar level courtyard. **Figure 10** presents the location of the cover system and applicable demarcation layers. The Excavation Work Plan (EWP) provided in **Attachment** B outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) (**Attachment G**) and associated Community Air Monitoring Plan (CAMP) prepared for the Site and provided in **Attachment** K.

3.3.2 Soil Vapor Extraction System

The RI identified petroleum impacted soil within the source area from 13 feet to 30 feet below grade (water table). Since excavation of the source area was performed to a depth of 15 feet below grade, a soil vapor extraction (SVE) system has been installed to remediate the petroleum contaminated soil within the unsaturated zone.

The SVE system consists of a 2 inch diameter soil vapor extraction well installed within the source area at depth immediately above the groundwater interface (approximately 29 feet below grade). The soil vapor extraction well consists of a 10 foot 0.010 screened section set immediately above the groundwater table, and riser pipe that raises to the new building's cellar floor. No. 00 morie gravel pack paced to a depth of approximately 5 feet above the screen followed by a hydrated bentonite seal. The soil vapor extraction well is connected via 2 inch diameter schedule 40 PVC pipe to a 2-hp regenerative blower with a particulate filter and vapor trap located on the roof of the new building. Air removed from the soil vapor extraction well by the blower passes through vapor-phase granular activated carbon prior to discharge at the roof.

The SVE system was started on October 31, 2015, and operates at all times.

Procedures for operating and maintaining the Soil Vapor Extraction system are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As built drawings, signed and sealed by a professional engineer, are included in **Attachment** I – Operations and Maintenance Manual. **Figure 7** shows the layout of the Soil Vapor Extraction system installed at the Site.

3.3.3 In-Situ Chemical Oxidant (ISCO) Treatment

Gasoline related VOCs are present in groundwater at a concentration above GQS in a diagonal strip from the northeast to the southwest corners of the Site. Remediation of dissolved phase VOCs in groundwater will be accomplished through a chemical oxidant- oxygen release injection program. The area of injection is within and up gradient of the source area. Injections at these locations deliver oxidant and oxygen release compounds to the subsurface allowing it to flow southwest with groundwater treating both residual contaminants in soil and the groundwater.

The ISCO treatment program utilizes eight new injections wells (IW1-IW8) for oxidant application. Injection wells IW1 and IW2 are located in the northeast corner of the cellar level rear courtyard, and injection wells IW3 through IW8 are located in the cellar of the new apartment building. Each of the injection wells are constructed of 1-inch pvc with a 10 ft 0.010-inch slot screened section installed 8 ft below the water table, and 2 ft above the water table. A No. 1 morie gravel pack is placed around the screen to a depth of approximately 1 ft above the screen followed by a 1 ft hydrated bentonite pellet seal. The injection wells are finished at the surface with a 5-inch bolt down manhole cover. **Figure 8** shows the location of each of the injection wells.

3.3.4 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.4.1 - Cover

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

3.3.4.2 - Soil Vapor Extraction System (SVE)

The SVE system will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the SVE system may no longer be required, a proposal to discontinue the system will be submitted by the remedial party. Conditions that may warrant discontinuing the SVE system include contaminant concentrations in groundwater and/or soil that: (1) reach levels that are consistently below ambient water quality standards or the site SCGs, as appropriate; (2) have become asymptotic to a low level over an extended period of time, as accepted by the NYSDEC; or (3) the NYSDEC has determined that the SVE system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC.

3.3.4.3 - In-Situ Chemical Oxidant (ISCO) Treatment

In the event that monitoring data indicates that the in-situ chemical oxidant treatment (ISCO) system may no longer be required, a proposal to discontinue ISCO treatments, including the results of an impact study, will be submitted by the remedial party. Conditions that may warrant discontinuing the ISCO treatment include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards or the site SCGs as appropriate, (2) have become asymptotic to a low level over an extended period of time as accepted by the NYSDEC; or (3) the NYSDEC has determined that injections of chemical oxidants has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan provided in **Attachment F**.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site – wide Inspection

Site-wide inspections will be performed at a minimum once per year. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in **Attachment H** – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date; and

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the Site will be conducted

within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 ISCO Monitoring and Sampling

4.3.1 ISCO Monitoring

Monitoring of the ISCO treatment will be performed on a quarterly basis, as identified in **Table 4** ISCO Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the injection wells and monitoring wells will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when an emergency occurs that is deemed likely to affect the operation of the system. ISCO system components to be monitored include, but are not limited to, the components included in **Table 4** below.

Table 4 – ISCO Monitoring Requirements and Schedule

ISCO System Component	Monitoring Parameter	Monitoring Schedule
Injection Wells	Condition, PID Screen, Depth to water, depth to bottom.	Quarterly
Monitoring Wells	Condition, PID Screen, Depth to water, depth to bottom.	Quarterly

A complete list of components to be inspected is provided in the Inspection Checklist, provided in **Attachment H** - Site Management Forms. If the monitoring wells or injections wells have been damaged, lost, or require redevelopment, maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.3.2 ISCO Treatment Sampling

One month following oxidant application, groundwater samples will be collected from monitoring wells 14MW1, 14MW2, 14MW3 and 14MW4 to monitor effectiveness of the chemical oxidant injection(s). Sampling locations, required analytical parameters and schedule

are provided in **Table 5** – ISCO Treatment Assessment Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 5 – ISCO Treatment Assessment Sampling Requirements and Schedule

Sampling Location	**Analytical Parameters**			**Schedule**
	VOCs (EPA Method 8260C)	SVOCs (EPA Method 8270D)	Persulfate, Fe2, pH	
14MW1	X	X	X	One month after injection
14MW2	X	X	X	One month after injection
14MW3	X	X	X	One month after injection
14MW4	X	X	X	One month after injection
Container	(3) 25mL VOAs preserved with HCL	(2) Amber Liters	-	

Detailed sample collection and analytical procedures and protocols are provided in **Attachment E** – Field Sampling Plan and **Attachment F** – Quality Assurance Project Plan.

Groundwater samples will be collected approximately one month after each chemical oxidant injection to monitor the effectiveness of the chemical oxidant injections. Modification to the frequency or sampling requirements will require approval from the NYSDEC. The network of monitoring wells has been installed immediately down-gradient of all volatile organic carbon remediation areas for the purpose of evaluation of the effectiveness of the chemical oxidant injections.

Table 6 summarizes the wells identification number, location, depths, diameter and screened intervals of the wells. As part of each groundwater monitoring event, the three monitoring wells installed in the sidewalk and the one monitoring well installed in the cellar level rear courtyard (14MW4) are to be sampled to monitor groundwater quality. Monitoring well construction logs are included in **Attachment D** of this document.

Table 6 – Monitoring Well Construction Details

MW ID	Well Location	Coordinates (longitude/ latitude)	Well Diameter (inches)	Installation Depth (ft)	
				Riser Interval	Screen Interval
14MW1	In sidewalk immediately south of source area	40°41'44.12" N, 73°56'23.47" W	1	12-25	25-40ft
14MW2	In sidewalk immediately south of source area	40°41'44.17" N, 73°56'23.28" W	1	12-25	25-40ft
14MW3	In sidewalk immediately south of source area	40°41'44.22" N, 73°56'23.10" W	1	12-25	25-40ft
14MW4	In northeast corner of the rear cellar level courtyard	40°41'44.93" N, 73°56'23.18" W	1	12-25	25-40ft

In accordance with the Remedial Action Work Plan, four monitoring wells (14MW1, 14MW2, 14MW3 and 14MW4) were installed at the Site. Monitoring well 14MW4 was installed in the rear courtyard when injection wells IW1 and IW2 were installed by C Squared Environmental Corp. Monitoring wells 14MW1, 14MW2 and 14MW3 were installed on October 5th and 6th of 2015, by Eastern Environmental Solutions, Inc. utilizing a Geoprobe. All four monitoring wells were constructed of 1 inch pvc casing with a 15 foot 0.010 screened section set approximately 9 feet below the water table. The wells were completed with a No. 00 morie gravel pack paced to a depth of approximately 5 feet above the screen followed by a hydrated bentonite seal. Groundwater was encountered at a depth of approximately 31 feet below grade. Therefore, all four monitoring wells were installed at a depth of 40 feet, consisting of 15 feet of screen and 25 feet of riser. The three monitoring wells installed within the sidewalk in front of the new building were protected with locking compression-style cap and an 8-inch bolt down manhole cover. The location of each of the monitoring wells is shown on **Figure 8**. Monitoring well construction logs are included in **Attachment D** of this document.

Following installation, each of the monitoring wells was surveyed to determine relative casing elevation to the nearest 0.01 ft and horizontal position to the nearest 0.1 ft. A synoptic round of depth-to-groundwater (DTW) measurements was obtained from the monitoring wells on October

15, 2015, to determine the water table elevation and to calculate the volume of standing water in the well. Groundwater was encountered in each of the monitoring wells at an approximate depth of 31 feet below sidewalk grade.

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC. The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.4 SVE Monitoring and Sampling

4.4.1 SVE System Monitoring

Monitoring of the soil vapor extraction system will be performed on a quarterly basis, as identified in **Table 7** - SVE Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete SVE system will be conducted during each monitoring event and groundwater sampling event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SVE system has been reported or an emergency occurs that is deemed

likely to affect the operation of the system. SVE system components to be monitored include, but are not limited to, the components included in **Table 7** below.

Table 7 – SVE Monitoring Requirements and Schedule

SVE System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Regenerative Blower	Flow Rate	TBD	Quarterly
Activated Carbon Drums	Expiration date, damage, labeling	-	Quarterly
Plumbing	Cracks, damage, labeling	-	Quarterly

A complete list of components to be inspected is provided in the Inspection Checklist, provided in **Attachment H**- Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.4.2 SVE System Sampling

Samples shall be collected from the soil vapor extraction (SVE) system on a routine basis. The SVE discharge will be field screened with a photo-ionization detector, and an SVE discharge sample will be collected after the carbon units within a 1 L tedlar bag using a vacuum or hand pump. The 1 L tedlar bag will be submitted for laboratory analysis of VOCs via EPA Method 624. The sampling location, required analytical parameters and schedule are provided in **Table 8** – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 8 – Remedial System Sampling Requirements and Schedule

Sampling Location	Field Screening Parameters	Analytical Parameters	
	PID	VOC (Method 624)	**Schedule**
SVE Discharge	X	X	Quarterly

Detailed sample collection and analytical procedures and protocols are provided in **Attachment E** – Field Sampling Plan and **Attachment F** – Quality Assurance Project Plan.

4.5 Composite Cover System Monitoring and Sampling

4.5.1 Composite Cover System Monitoring

Monitoring of the Composite Cover System will be performed on a routine basis, as identified in **Table 9 -** Remedial System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete system will be conducted during each monitoring event. The Composite Cover System includes the 4 inch thick concrete building slab, the 2 inch thick concrete pavers covering the cellar level rear courtyard, and a minimum of 2 feet of certified clean soil covering the at grade landscaped areas in the rear of the lot. The composite cover system will be monitored to document existing conditions and ensure that no penetrations or damage has occurred which will affect cover system integrity. The cover system is in place to prevent human exposure to remaining soil/fill above Unrestricted Use SCOs at Site.

Unscheduled inspections may take place when a suspected failure of the Composite Cover System system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. The Composite Cover System components to be monitored include, but are not limited to, the components included in **Table 9** below.

Table 9 – Remedial System Monitoring Requirements and Schedule

Cover Component	Monitoring Parameter	Monitoring Schedule
Cellar Building Slab (4 inches thick)	Inspect for penetrations, holes, cracks, etc.	Quarterly
Rear Courtyard finished with 2 inch thick 24” by 24” Concrete Pavers	Inspect for damage, and determine if repair/replacement is required.	Quarterly
Rear at grade Landscaped Courtyard Minimum of 2 feet of certified clean soil	Inspect evidence of newly imported soil, or excavation	Quarterly

A complete list of components to be inspected is provided in the Inspection Checklist, provided in **Attachment H** - Site Management Forms. If any penetrations, holes, cracks or other disturbances are noted within the composite cover system components, maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.6 Post-Remediation Groundwater Sampling

Groundwater samples will be collected from 14MW1, 14MW2, 14MW3 and 14MW4 after each chemical oxidant injection event to confirm the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Sampling locations and required analytical parameters are provided in **Table 5** – ISCO Treatment Assessment Sampling Requirements and Schedule above. Modification to the sampling requirements will require approval from the NYSDEC.

Detailed sample collection and analytical procedures and protocols are provided in **Attachment E** – Field Sampling Plan and **Attachment F** – Quality Assurance Project Plan.

4.6.1 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in **Attachment H** - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Sampling Plan provided as **Attachment E** of this document.

4.7 Soil Vapor Intrusion Evaluation

Since post-remedial soil vapor sampling was not completed to verify that the remedial objective for soil vapor was attained, a soil vapor intrusion evaluation will be conducted within the completed building prior occupancy. Details for this evaluation will be determined upon completion of the on-Site building.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the Site to operate and maintain the composite cover system, SVE system, ISCO systems;
- Will be updated periodically to reflect changes in site conditions or the manner in which the composite cover system, SVE system, and ISCO system are operated and maintained.

Further detail regarding the Operation and Maintenance of the composite cover system, SVE system, ISCO system is provided in **Attachment I** - Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP , is maintained at the Site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial System Performance Criteria

The SVE system consists of a 2-hp regenerative blower with a particulate filter and vapor trap connected to a single 2 inch diameter PVC well installed just above the groundwater interface. Prior to discharge, the soil vapor extracted from the SVE well passes through a drum containing vapor-phase granular activated carbon. The 2-hp regenerative blower operates at all times, and should be operating within an air flow rate range of 100 to 140 CFM.

5.3 Operation and Maintenance of Soil Vapor Extraction System

Cut-sheets and as-built drawings for the soil vapor extraction system are provided in **Attachment I** - Operations and Maintenance Manual. The SVE system is not adjustable and the regenerative blower shall not be serviced or repaired at the Site. If the blower fails, the unit will need to be removed and rebuilt by the building super, or replaced with a new/rebuilt 2-hp regenerative blower.

5.3.1 System Start-Up and Testing

The system is currently installed and operating. If the blower fails, the unit will need to be removed and rebuilt by the building super, or replaced with a new/rebuilt 2-hp regenerative blower. Following installation of the new or rebuilt 2-hp regenerative blower, the following items should be inspected to ensure proper operation:

1) Check all exposed/visible SVE piping for evidence of damage, cracks, or leaks.
2) Turn system on and off to ensure the audible alarm is functioning properly;
3) Record vacuum readings and pressure readings (discharge prior to carbon drums).

The system testing described above will be conducted if, in the course of the SVE system lifetime, the system goes down or significant changes are made to the system and the system must be restarted.

5.3.2 Routine System Operation and Maintenance

The SVE system is not adjustable and the regenerative blower shall not be serviced or repaired at the Site.

Periodic sampling of the soil vapor discharge after the drums containing vapor-phase granular activated carbon will determine if breakthrough has occurred and the drums need to be replaced. To minimize time the system is turned off, new drums should be ready to install when removing/disconnecting the spent drums.

A copy of an Operations and Maintenance Manual specific to the remedial systems should be provided in **Attachment I**, which will provide further detail on the above.

5.3.3 System Monitoring Devices and Alarms

The soil vapor extraction system does not utilize any system monitoring devices/alarms. The 2-hp regenerative blower operates continuously. In the event the blower fails, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the soil vapor extraction system will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focuses on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames.

6.2 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the Site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the Site and/or engineering controls to severe storms/weather events and associated flooding.

The Site is located in the northern portion of Brooklyn, NY. It is located at an elevation of 46 feet above the National Geodetic Vertical Datum (NGVD), or approximately 49 feet above sea level. According to the FEMA Flood Map, the Site is not located within a flood hazard area. The Site is served by the NYC Municipal sewer system and the completed building will meet all NYC building codes for drainage. Therefore, the Site is not considered to be vulnerable to storm events related to climate change.

6.3 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the Periodic Review Report (PRR).

6.3.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at

any time that the Project Manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.3.2 Frequency Of System Checks, Sampling And Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site in order to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

As part of this effort, consideration shall be given to:

- Reduced site visits and system checks;
- Coordination/consolidation of activities to maximize foreman/labor time; and
- Use of mass transit for site visits, where available.

6.3.3 Metrics and Reporting

As discussed in Section 7.0 and as shown in **Attachment H** – Site Management Forms, information on energy usage, solid waste generation, transportation and shipping, water usage and land use and ecosystems will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits; a set of metrics has been developed

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in **Attachment H**. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of **Table 10** and summarized in the Periodic Review Report.

Table 10: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Periodic Review Report	Annually, or as otherwise determined by the Department

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;

- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the Department beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the Department or at another frequency as may be required by the Department. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site described in **Attachment C** - Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site;
- Results of the required annual site inspections and severe condition inspections, if applicable;
- All applicable site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted;
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions;
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends;
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS^{TM} database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html;
- A site evaluation, which includes the following:

  - The compliance of the remedy with the requirements of the site-specific RAWP, ROD or Decision Document;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
  - Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document; and
  - The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the Site during the calendar year, including information such as:
  - The number of days the system operated for the reporting period;
  - The average, high, and low flows per day;
  - The contaminant mass removed;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;
  - Trends in equipment failure;
  - A summary of the performance, effluent and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional or Professional Engineer licensed to practice in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

"For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program [and generally accepted engineering practices]; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative] (and if the site consists of multiple properties): *[I have been authorized and designated by all site owners/remedial parties to sign this certification] for the site."*

If the remedy requires only an institutional control, include the following:

At the end of each certifying period, as determined by the NYSDEC, the following certification will be provided to the Department:

"For each institutional identified for the site, I certify that all of the following statements are true:

- *The institutional control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement.*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] (and if the site consists of multiple properties): [and I have been authorized and designated by all site owners to sign this certification] for the site."

For BCP projects which the Department has determined do not represent a significant threat to public health or the environment, but where contaminants in groundwater exceed drinking water standards, the following should also be included for both IC/EC and IC scenarios listed above:

- *No new information has come to my attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid; and*

For BCP projects, every five years the following certification will be added:

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The Periodic Review Report may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3) upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in **Attachment J**. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located, Site Control and the NYSDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

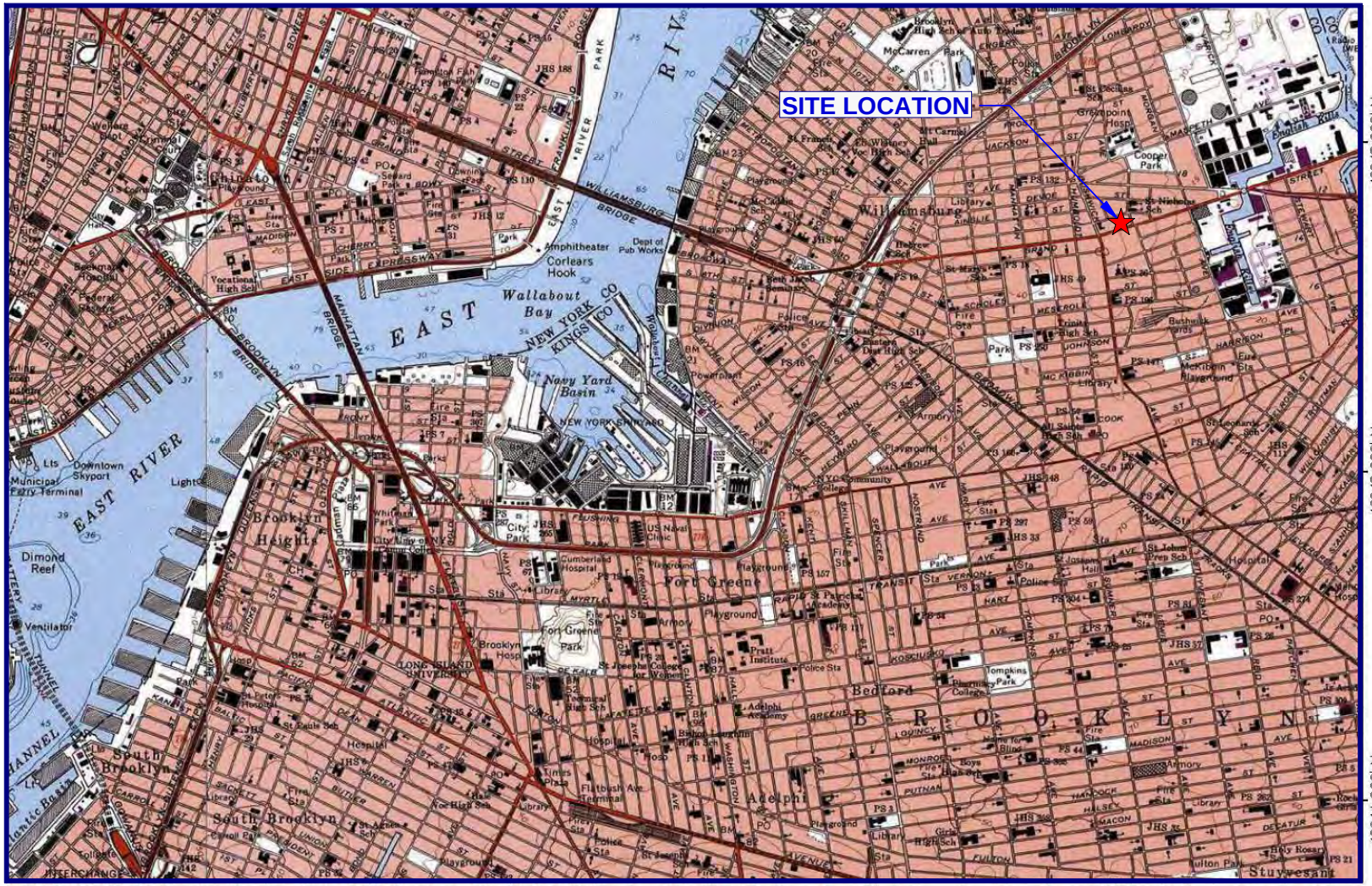
Phase I Environmental Site Assessment Report. Environmental Business Consultants, February 13, 2013.

Limited Phase II Subsurface Investigation. Environmental Business Consultants, March 3, 2013.

Remedial Action Work Plan. Environmental Business Consultants, January 2015.

Remedial Investigation Report. Environmental Business Consultants, October 2014.

FIGURES



USGS Brooklyn Quadrangle 1995, Contour Interval = 10 feet

EBC
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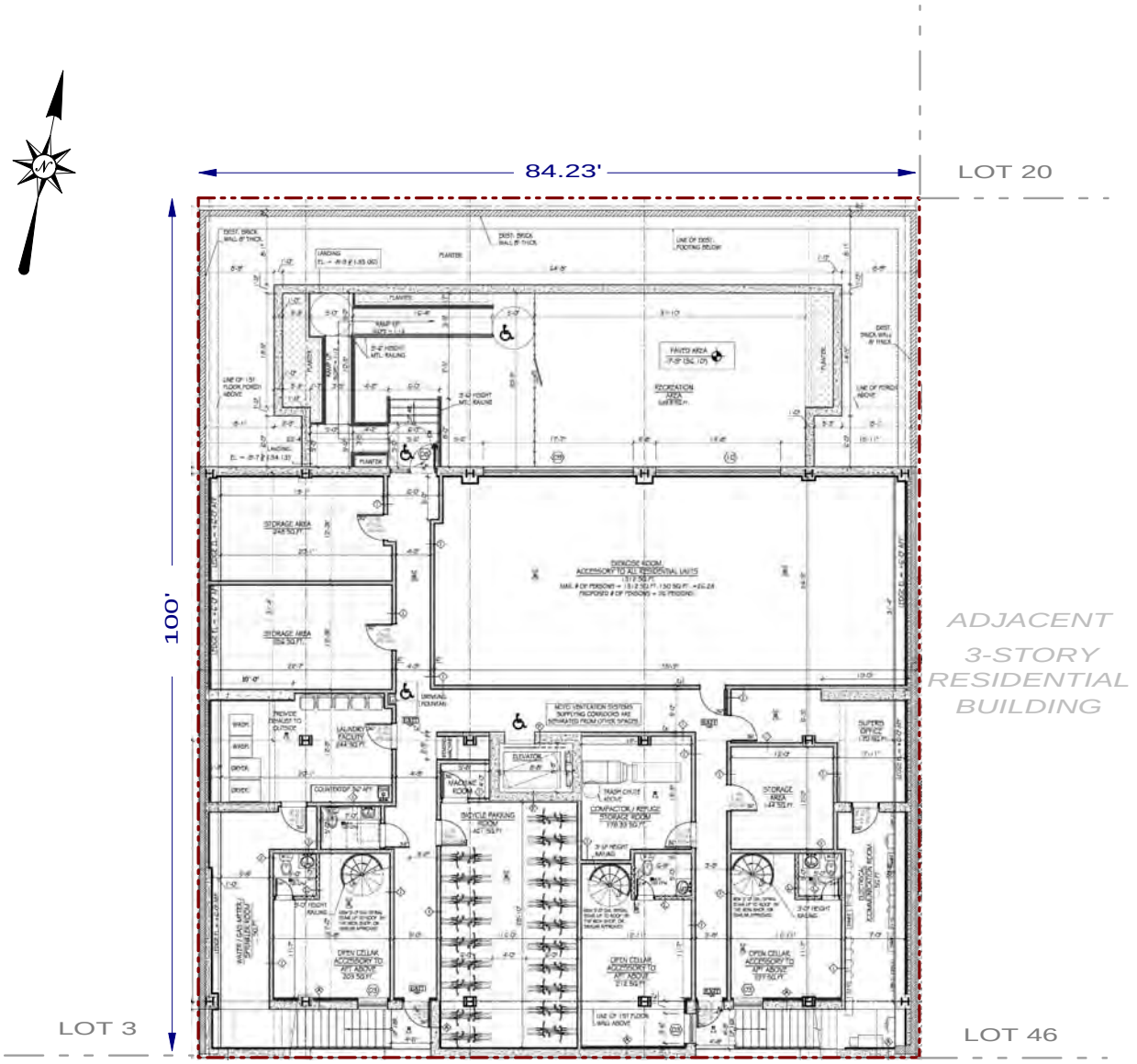
1808 MIDDLE COUNTRY ROAD. RIDGE. NY 11961
Phone 631.504.6000
Fax 631.924.2780

845 GRAND STREET
BROOKLYN, NY

FIGURE 1 SITE LOCATION MAP



KEY:

PROPERTY BOUNDARY

SCALE:

0 10 20

Scale: 1 inch = 20 feet

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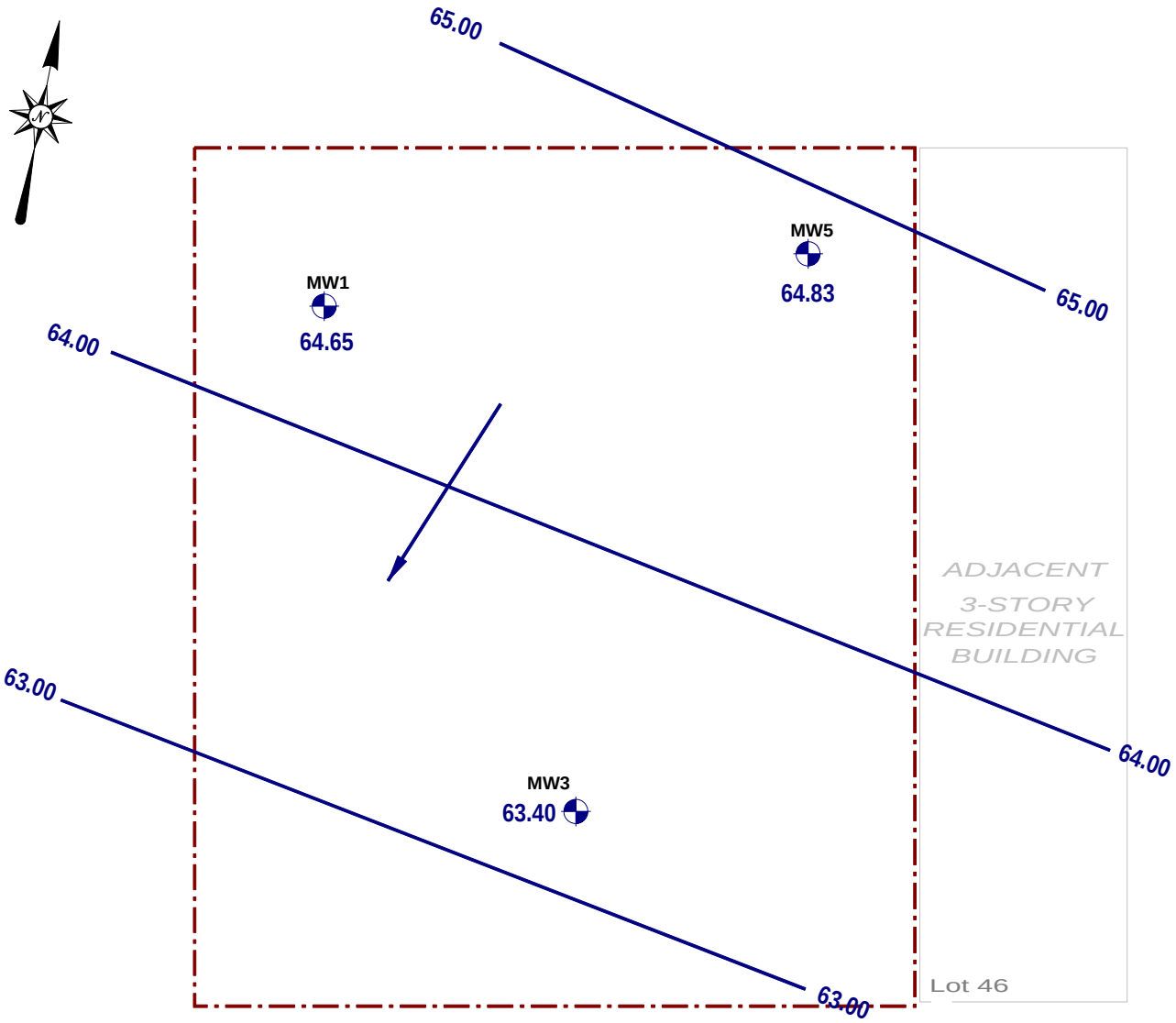
Fax 631. 924 .2870

Figure No. 2

Site Name: FORMER BENNETT TRUCKING CORP. SITE

Site Address: 845 GRAND STREET, BROOKLYN, NY

Drawing Title: SITE PLAN



KEY

Property Line

RI Monitoring Well Location

0 10 20

Scale: 1 inch = 20 feet

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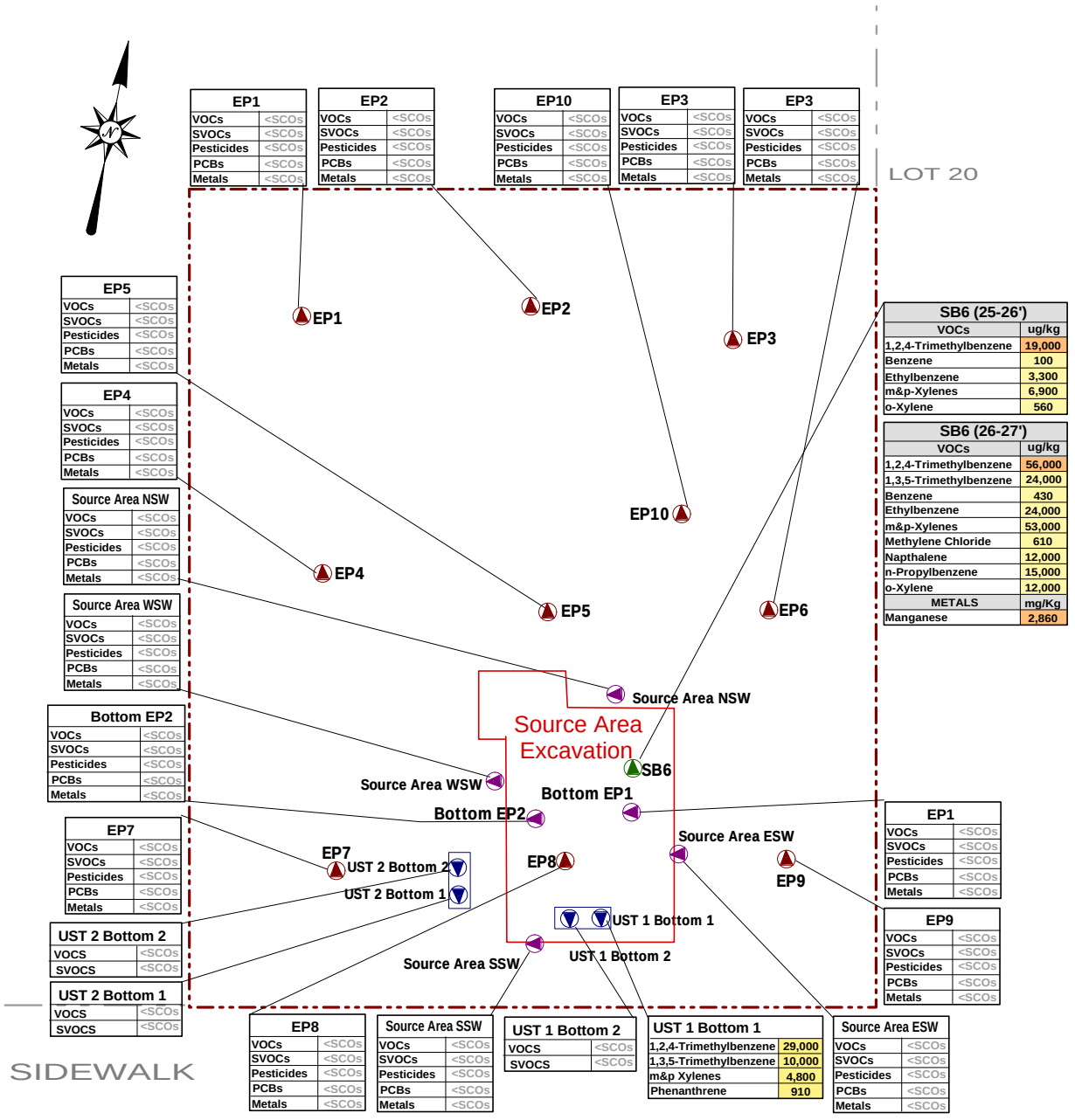
Figure No. 3

Site Name: FORMER BENNETT TRUCKING CORP. SITE

Site Address: 845 GRAND STREET, BROOKLYN, NY

Drawing Title: GROUNDWATER ELEVATION MAP (RI DATA)



EP1	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP2	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP10	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP3	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP3	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP5	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP4	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

Source Area NSW	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

Source Area WSW	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

Bottom EP2	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP7	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

UST 2 Bottom 2	
VOCS	<SCOs
SVOCS	<SCOs

UST 2 Bottom 1	
VOCS	<SCOs
SVOCS	<SCOs

SB6 (25-26')	
VOCs	ug/kg
1,2,4-Trimethylbenzene	19,000
Benzene	100
Ethylbenzene	3,300
m&p-Xylenes	6,900
o-Xylene	560

SB6 (26-27')	
VOCs	ug/kg
1,2,4-Trimethylbenzene	56,000
1,3,5-Trimethylbenzene	24,000
Benzene	430
Ethylbenzene	24,000
m&p-Xylenes	53,000
Methylene Chloride	610
Napthalene	12,000
n-Propylbenzene	15,000
o-Xylene	12,000
METALS	mg/Kg
Manganese	2,860

EP1	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP9	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

EP8	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

Source Area SSW	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

UST 1 Bottom 2	
VOCS	<SCOs
SVOCS	<SCOs

UST 1 Bottom 1	
1,2,4-Trimethylbenzene	29,000
1,3,5-Trimethylbenzene	10,000
m&p Xylenes	4,800
Phenanthrene	910

Source Area ESW	
VOCs	<SCOs
SVOCs	<SCOs
Pesticides	<SCOs
PCBs	<SCOs
Metals	<SCOs

KEY:

- PROPERTY BOUNDARY
- RI SOIL BORING LOCATION
- ENDPOINT SOIL SAMPLE LOCATION
- UST BOTTOM SOIL SAMPLE LOCATION
- SOURCE AREA ENDPOINT SOIL SAMPLE LOCATION
- ENDPOINT SOIL SAMPLE LOCATION
- RESTRICTED RESIDENTIAL SCO EXCEEDENCE
- UNRESTRICTED USE SCO EXCEEDENCE
- 550-GALLON UST

SCALE:

0 10 20

Scale: 1 inch = 20 feet

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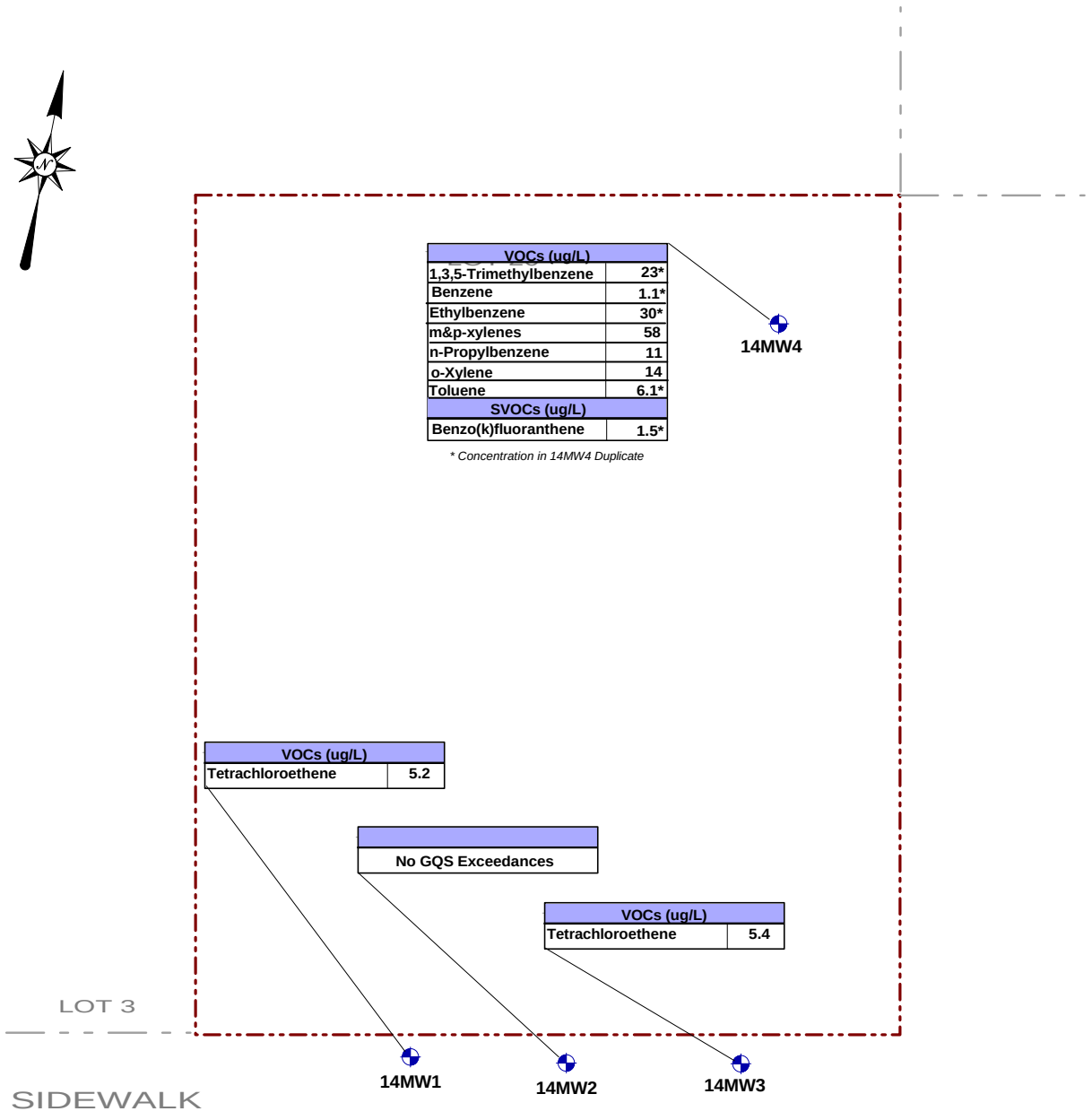
Figure No. 4

Site Name: FORMER BENNETT TRUCKING CORP. SITE
Site Address: 845 GRAND STREET, BROOKLYN, NY
Drawing Title: POSTED SOIL EXCEEDANCES MAP



KEY:

PROPERTY BOUNDARY

New Performance Well Location

SCALE:

0 10 20

Scale: 1 inch = 20 feet

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Fax 631. 924 .2870

Figure No. 5

Site Name: FORMER BENNETT TRUCKING CORP. SITE

Site Address: 845 GRAND STREET, BROOKLYN, NY

Drawing Title: REMAINING GROUNDWATER SAMPLE EXCEEDANCES MAP

SG1

Compound	µg/m3
Acetone	9.54
Benzene	1.02
Carbon Tetrachloride	0.503
Chloromethane	1.44
Dichlorodifluoromethane	2.96
Ethanol	20.03
Heptane	1.6
Hexane	1.27
Isopropylalcohol	179
Xylene (m&p)	1.26
Methyl Ethyl Ketone	1.09
Methylene Chloride	1.32
Propylene	1.2
Tetrachloroethene	0.271
Toluene	2.37
Trichlorofluoromethane	1.74

SG5

Compound	µg/m3
1,2,4-Trimethylbenzene	23
1,3,5-Trimethylbenzene	6.24
4-Ethyltoluene	8.65
Acetone	203
Benzene	24.5
Carbon Disulfide	0.314
Cyclohexane	12.2
Dichlorodifluromethane	2.72
Ethanol	8.34
Ethylbenzene	55.5
Heptane	68
Hexane	49
Isopropylalcohol	2.6
Isopropylbenzene	2.5
Xylene (m&p)	182
Methyl Ethyl Ketone	8.13
Methylene Chloride	1.42
n-Butylbenzene	1.43
Xylene (o)	46.9
Propylene	50.7
Tetrachloroethene	15.8
Toluene	269
Trichloroethene	4.3
Trichlorofluoromethane	1.8

SG1

SG3

Compound	µg/m3
1,2,4-Trimethylbenzene	32.8
1,3,5-Trimethylbenzene	7.71
4-Ethyltoluene	10.9
4-Methyl-2-pentanone	1.8
Acetone	47.2
Benzene	23.3
Carbon Disulfide	16.4
Chloroform	10.7
Cyclohexane	5.78
Dichlorodifluromethane	53.9
Ethanol	34.1
Ethyl Acetate	1.8
Ethylbenzene	61.6
Heptane	51.2
Hexane	32
Isopropylalcohol	10.3
Isopropylbenzene	2.7
Xylene (m&p)	200
Methyl Ethyl Ketone	7.43
Methylene Chloride	1.11
n-Butylbenzene	2.36
Xylene (o)	49.9
Propylene	5.38
Tetrachloroethene	4
Toluene	308
Trichlorofluoromethane	4.6

SG3

SG2

SG2

Compound	µg/m3
1,2,4-Trimethylbenzene	41.8
1,3,5-Trimethylbenzene	13.3
4-Ethyltoluene	15.4
4-Isopropyltoluene	1.1
4-Methyl-2-pentanone	2.37
Acetone	36.6
Benzene	7.69
Carbon Disulfide	20.8
Carbon Tetrachloride	0.314
Chloroform	7.61
Cyclohexane	3.51
Dichlorodifluromethane	4.4
Ethanol	48.6
Ethyl Acetate	1.37
Ethylbenzene	43.4
Heptane	20.9
Hexane	11.9
Isopropylalcohol	1.18
Isopropylbenzene	3.1
Xylene (m&p)	173
Methyl Ethyl Ketone	4.07
Methylene Chloride	1.04
n-Butylbenzene	2.19
Xylene (o)	54.2
Propylene	6.05
Tetrachloroethene	4.81
Toluene	132
Trichloroethene	0.43
Trichlorofluoromethane	3.26

SG4

SG4

Compound	µg/m3
1,1,1-Trichloroethane	12.6
1,2,4-Trimethylbenzene	14.8
1,3,5-Trimethylbenzene	3.88
4-Ethyltoluene	3.24
Acetone	58.2
Benzene	8.59
Carbon Disulfide	15.7
Carbon Tetrachloride	3.4
Chloroform	30.5
Cyclohexane	4.61
Dichlorodifluromethane	19.8
Ethanol	190
Ethyl Acetate	4.46
Ethylbenzene	10.4
Heptane	12.6
Hexane	12.4
Isopropylalcohol	2.5
Isopropylbenzene	1.08
Xylene (m&p)	35.7
Methyl Ethyl Ketone	3.45
n-Butylbenzene	1.64
Xylene (o)	13.2
Propylene	4.28
Tetrachloroethene	15.2
Toluene	64.4
Trichloroethene	14.8
Trichlorofluoromethane	2.64

SG5

SG6

SG6

Compound	µg/m3
1,2,4-Trimethylbenzene	11.3
1,3,5-Trimethylbenzene	3.29
4-Ethyltoluene	6.68
Acetone	382
Benzene	43.7
Carbon Disulfide	0.377
Cyclohexane	13.7
Dichlorodifluromethane	3.01
Ethanol	11.7
Ethylbenzene	153
Heptane	114
Hexane	33.9
Isopropylalcohol	4.91
Isopropylbenzene	3.59
Xylene (m&p)	345
Methyl Ethyl Ketone	20.9
Methylene Chloride	1.56
Xylene (o)	81.1
Propylene	20
Tetrachloroethene	19
Toluene	621
Trichloroethene	0.806
Trichlorofluoromethane	1.68

SIDEWALK

GRAND STREET

KEY

Property Line

SGx

Soil Gas Location

0 10 20

Scale: 1 inch = 20 feet

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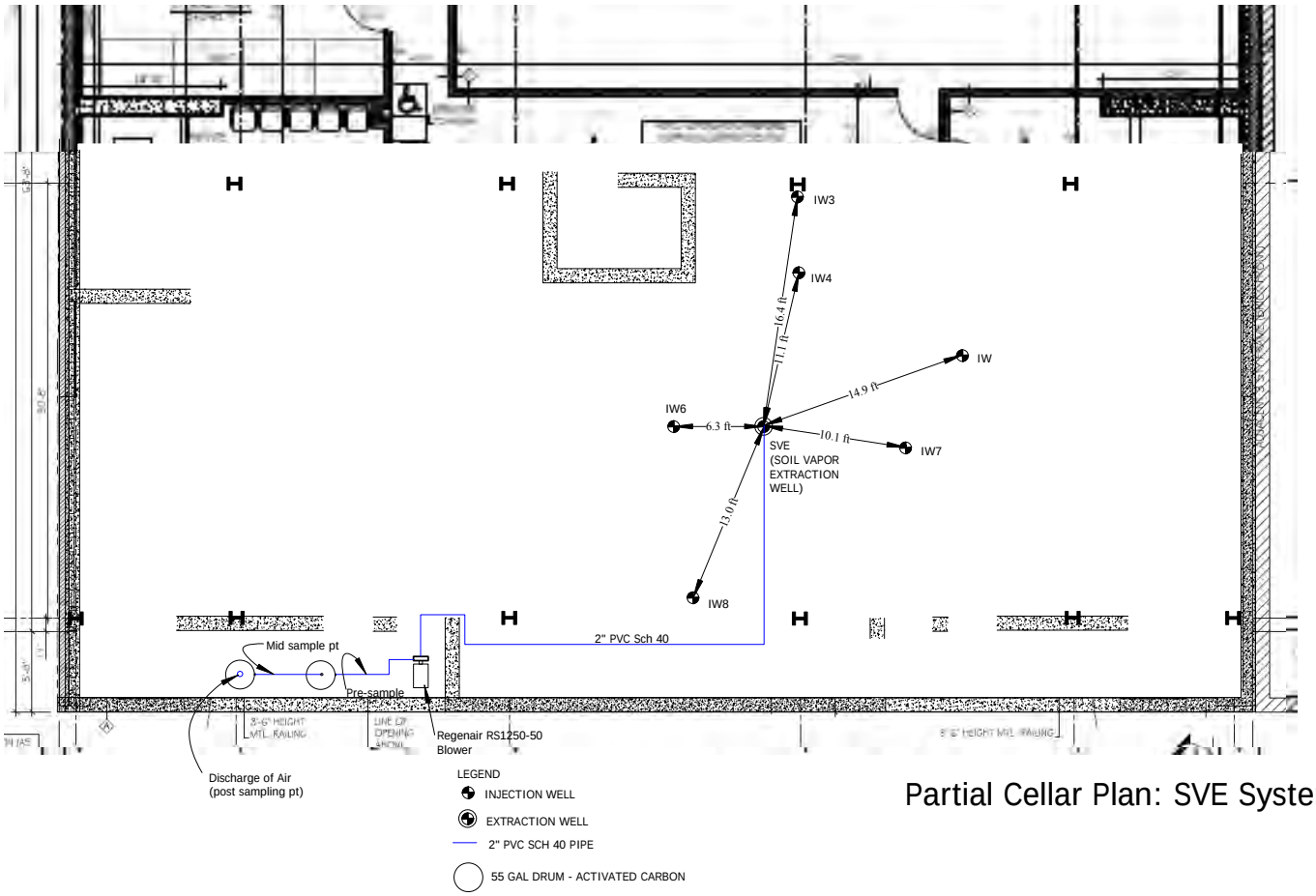
Figure No. 6

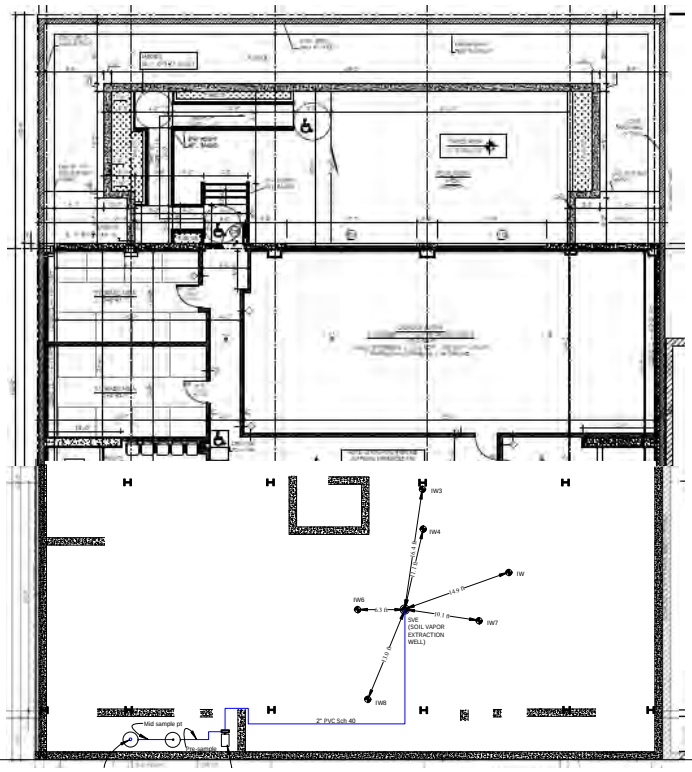
Site Name: Former Bennett Trucking Corp. Site

Site Address: 845 Grand Street, Brooklyn, NY

Drawing Title: Remaining Soil Vapor Sample Exceedances



Partial Cellar Plan: SVE System



Cellar Plan

El= -10'

El=0"

Sidewalk

Grand St

AMC ENGINEERING PLLC
99 JERICHO TURNPIKE
JERICHO, NY 11753
516 987-1662

PROJECT

Former Bennett Trucking
Corp Site - C224181
845 Grand St
Brooklyn, NY

TITLE:

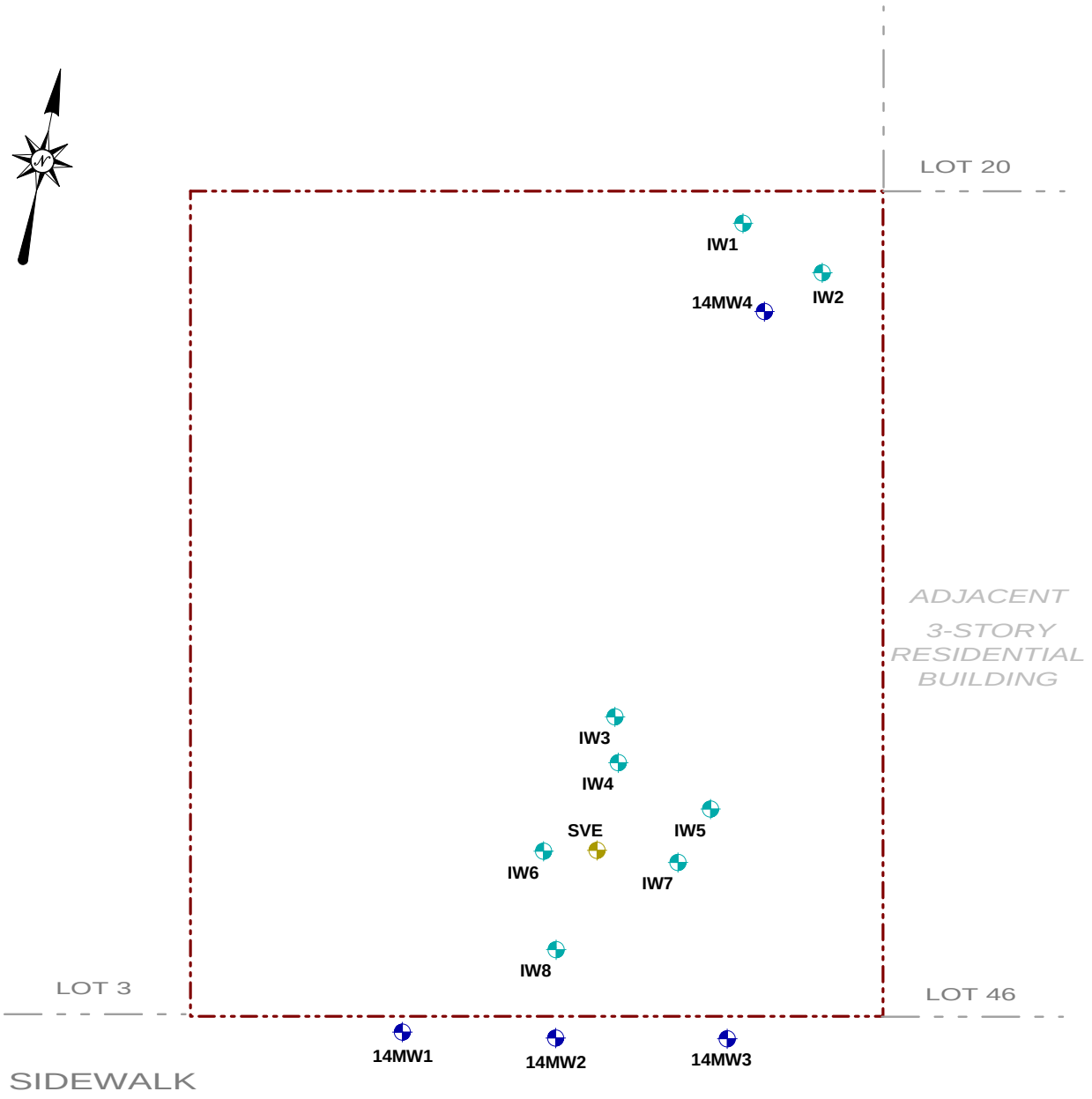
Soil Vapor Extraction
Plan: As built

STATE OF NEW YORK
ARIEL CZEMERINSKI
LICENSED PROFESSIONAL ENGINEER
076508

DATE: 10/1/15
PROJECT No:
DRAWING BY: AC
CHK BY:
DWG No:

FIGURE 7

CADD FILE No:



KEY:

- PROPERTY BOUNDARY
- PERFORMANCE MONITORING WELL LOCATION
- OXIDANT INJECTION WELL
- SVEWELL

SCALE:

0 10 20

Scale: 1 inch = 20 feet

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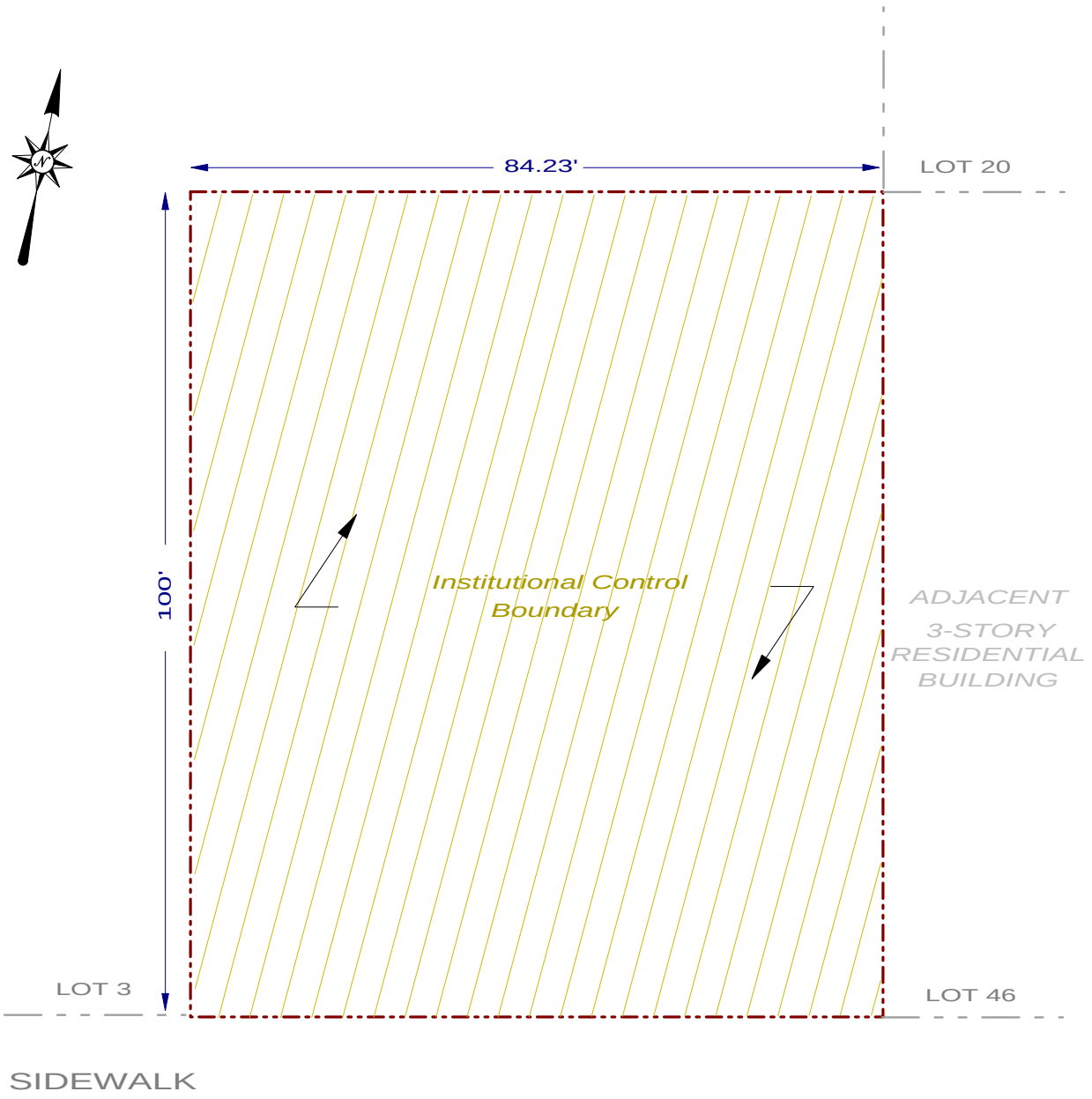
Figure No. 8

Site Name: FORMER BENNETT TRUCKING CORP. SITE
Site Address: 845 GRAND STREET, BROOKLYN, NY
Drawing Title: INJECTION AND MONITORING WELL LOCATIONS



KEY:

PROPERTY BOUNDARY

SCALE:

0 10 20

Scale: 1 inch = 20 feet

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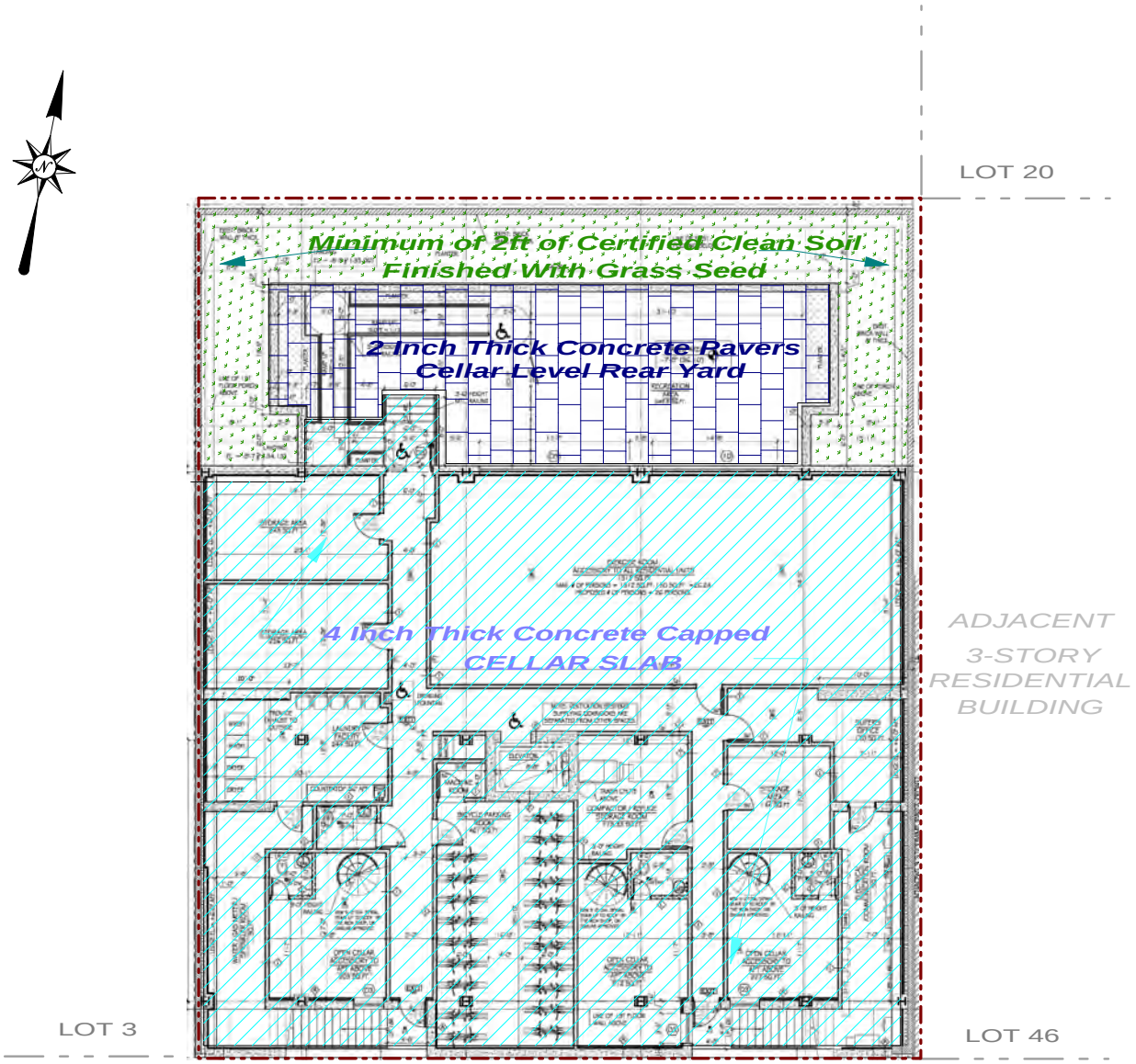
Phone 631.504.6000
Fax 631. 924 .2870

Figure No. 9

Site Name: FORMER BENNETT TRUCKING CORP. SITE

Site Address: 845 GRAND STREET, BROOKLYN, NY

Drawing Title: INSTITUTIONAL CONTROL BOUNDARIES



KEY:

PROPERTY BOUNDARY

SCALE:

0 10 20

Scale: 1 inch = 20 feet

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Phone 631.504.6000
Fax 631. 924 .2870

Figure No. 10

Site Name: FORMER BENNETT TRUCKING CORP. SITE

Site Address: 845 GRAND STREET, BROOKLYN, NY

Drawing Title: ENGINEERING CONTROL LOCATION (COVER)

ATTACHMENT A
LIST OF SITE CONTACTS

LIST OF SITE CONTACTS

Name	Phone/Email Address
Site Owner and Remedial Party 845 Grand Development LLC Yidel Hirsch	 718-963-1128 hir797@aol.com
Qualified Environmental Professional Environmental Business Consultants Charles Sosik	 631.504.6000 CSosik@ebcincny.com
NYSDEC DER Project Manager Larry Alden	 518-402-9767 Larry.alden@dec.ny.gov
NYSDEC Regional HW Engineer Jane O'Connell	 718-482-4599 Jane.Oconnell@dec.ny.gov
NYSDEC Site Control Kelly Lewandowski	 518-402-9581 Kelly.Lewandowski@dec.ny.gov
Remedial Party Attorney Schnapf LLC Lawrence Schnapf	 212-876-3189 Larry@SchnapfLaw.com

ATTACHMENT B
EXCAVATION WORK PLAN

EXCAVATION WORK PLAN (EWP)

B-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the NYSDEC. Table B-1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in **Attachment A**.

Table 1: Notifications*

Name	Contact Information
Larry Alden	518-402-9767, Larry.alden@dec.ny.gov
Jane O'Connell	718-482-4599, Jane.Oconnell@dec.ny.gov
Kelly Lewandowski	518-402-9581, Kelly.Lewandowski@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;

- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in **Attachment G** of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

B-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Section B-5 of this Attachment.

B-3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

B-4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

B-5 MATERIALS TRANSPORT OFF-SITE

All 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.

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.

Truck transport routes are as follows: ENTERING SITE - from the Brooklyn Queens Expressway take the Metropolitan Avenue exit (32). Merge onto Rodney Street, and turn left onto Metropolitan Avenue. Make the first right onto Union Avenue and continue four blocks to Grand Street. Make a left to head east on Grand Street. The Site entrance will be on the left. EXITING SITE – turn right out of Site onto Grand Street (head west). Turn right onto Union Avenue. Head north on Union Avenue to Metropolitan Avenue. Turn left onto Metropolitan Avenue, then turn left after passing under the Brooklyn Queens Expressway. Follow the signs for the Brooklyn Queens Expressway on-ramp..

All trucks loaded with site materials will exit the vicinity of the Site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

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

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

B-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of material from this Site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility

if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

B-7 MATERIALS REUSE ON-SITE

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. This soil will undergo a testing program to confirm that it meets unrestricted SCOs prior to unregulated disposal or reuse on-site. Confirmation testing of clean soils will be in accordance with DER-10 as follows:

Contaminant	**VOCs**	**SVOCs, Inorganics & PCBs/Pesticides**	
Soil Quantity (cubic yards)	**Discrete Samples**	**Composite**	**Discrete Samples/Composite**
0-50	1	1	Each composite sample for analysis is created from 3-5 discrete samples from representative locations in the fill.
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
1000	Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER		

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not

be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

B-8 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

B-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the decision document. The existing cover system is comprised of a minimum of the 4 inch thick concrete building slab, 2 inch thick 24” by 24” concrete pavers covering the cellar level rear courtyard, and minimum of 2 feet of certified clean soil within the at-grade rear courtyard surrounding the cellar level rear courtyard. If the type of cover system changes from that which exists prior to the excavation, this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP.

B-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table 1. Soils that meet 'exempt' 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 NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

B-11 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

B-12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

B-13 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

ATTACHMENT C
ENVIRONMENTAL EASEMENT

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 12th day of November, 2015, between Owner(s) 845 Grand Development, LLC, having an office at 11 Hayes Avenue, Unit 201, Monroe, New York 10950, County of Orange, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 845 Grand Street in the City of New York, County of Kings and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 2922 Lot 47, being the same as that property conveyed to Grantor by deed dated April 30, 2013 and recorded in the City Register of the City of New York in Instrument No. 2013050100864001. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.1926 +/- acres, and is hereinafter more fully described in the Land Title Survey dated June 21, 2015 prepared by Vincent M. Tuetonico, PLS of AAA Group, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is

extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C224181-11-13, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation

pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved b the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C224181
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail

and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in 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.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the 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.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the 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.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

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IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

845 Grand Development, LLC:

By: _____

Print Name: Yidel Hirsch

Title: Manager Date: 10/16/15

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Kings)

On the 16 day of October, in the year 20 __, before me, the undersigned, personally appeared Yidel Hirsch, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

JOSEPH S. SCARMATO
Notary Public, State of New York
Rockland County No. 02SC4996677
Expires November 14, 20 17

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 12th day of November, in the year 2015, before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2018

SCHEDULE "A" PROPERTY DESCRIPTION

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Brooklyn, County of Kings, City and State of New York, bounded and described as follows:

BEGINNING at a point on the Northerly side of Grand Street, distant 300 feet Westerly from the corner formed by the intersection of the Northerly side of Grand Street with the Westerly side of Olive Street;

RUNNING THENCE Northerly and parallel with Olive Street as laid on Map #754 of Kalbflesch and Fleet and at right angles to Grand Street, 100 feet to the center line of the block;

THENCE Westerly along said center line of the block 83 feet 11 inches, (Deed) 84 feet 3 ¾ inches (Calc.) 84 feet 2 ¾ inches (Tax Map);

THENCE Southerly parallel with said Olive Street as laid down on said map and at right angles to Grand Street, 100 feet to the Northerly side of the Grand Street;

THENCE Easterly along the Northerly side of Grand Street, 83 feet 6 3/8 inches (Deed) 84 feet 3 ¾ Inches (Tax Map and Calc.) to the point or place of BEGINNING.

Comprising of approximately 0.1926 acres more or less.

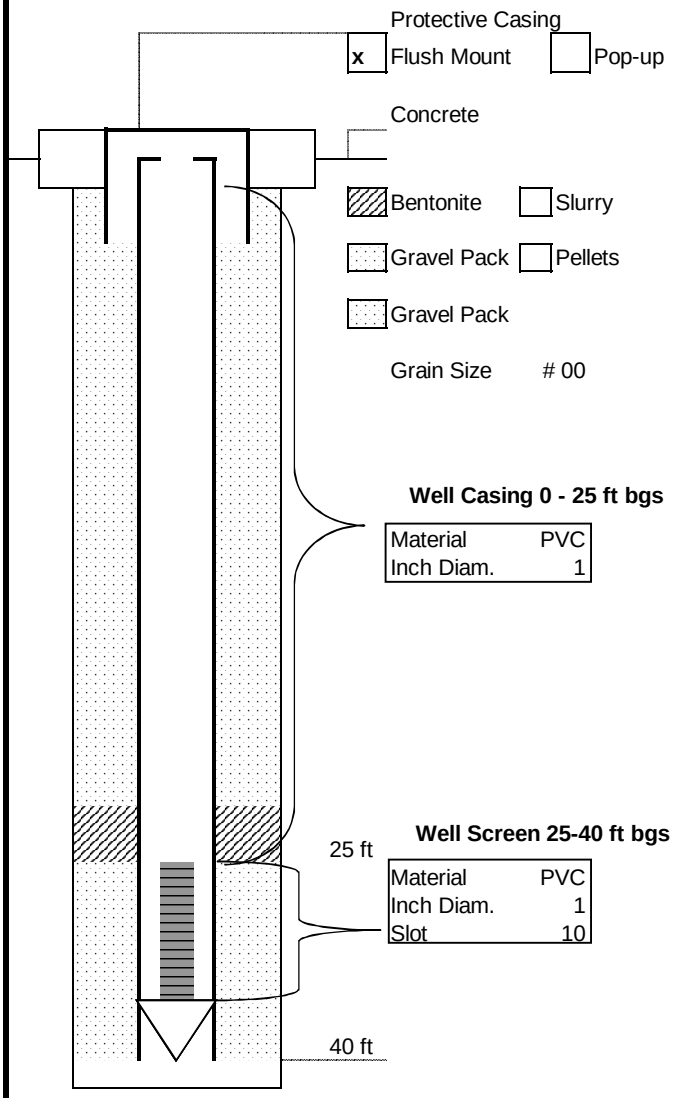
ATTACHMENT D
MONITORING WELL & SOIL BORING CONSTRUCTION LOGS

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

14 MW-1



Note: Drawing is not to scale.
Depths are given in feet below land surface.

Monitoring Well No.: 14MW1

Project: 845 Grand Street, Brooklyn, NY

Location: North end of Grand Street sidewalk, immediately in front of the new apartment building.

Depth to Groundwater: 31ft Date: 10/15/2015

Installation Depth: 40ftbg

Survey Point Elevation:

Installation Date: 10/6/2015

Drilling Contractor: Eastern Environmental Solutions, Inc.

Installation Method: Geoprobe - Hollow-Stem Auger

Water Removed During Development:

Hydrogeologist: Kevin Waters

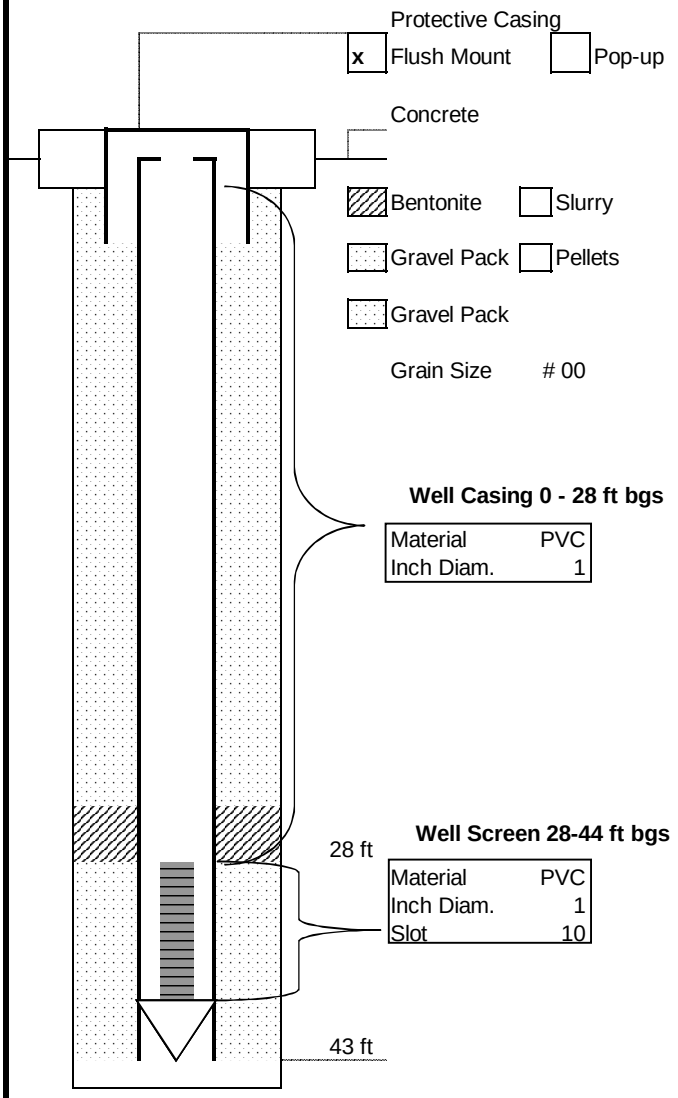
Company Name: EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

14 MW-2



Note: Drawing is not to scale.
Depths are given in feet below land surface.

Monitoring Well No.: 14MW2

Project: 845 Grand Street, Brooklyn, NY

Location:
Middle monitoring well of three installed in Grand Street sidewalk, immediately in front of the new apartment building.

Depth to Groundwater: 31ft Date: 10/15/2015

Installation Depth: 43ftbg

Survey Point Elevation:

Installation Date: 10/5/2015

Drilling Contractor: Eastern Environmental Solutions, Inc.

Installation Method: Geoprobe - Hollow-Stem Auger

Water Removed During Development:

Hydrogeologist: Kevin Waters

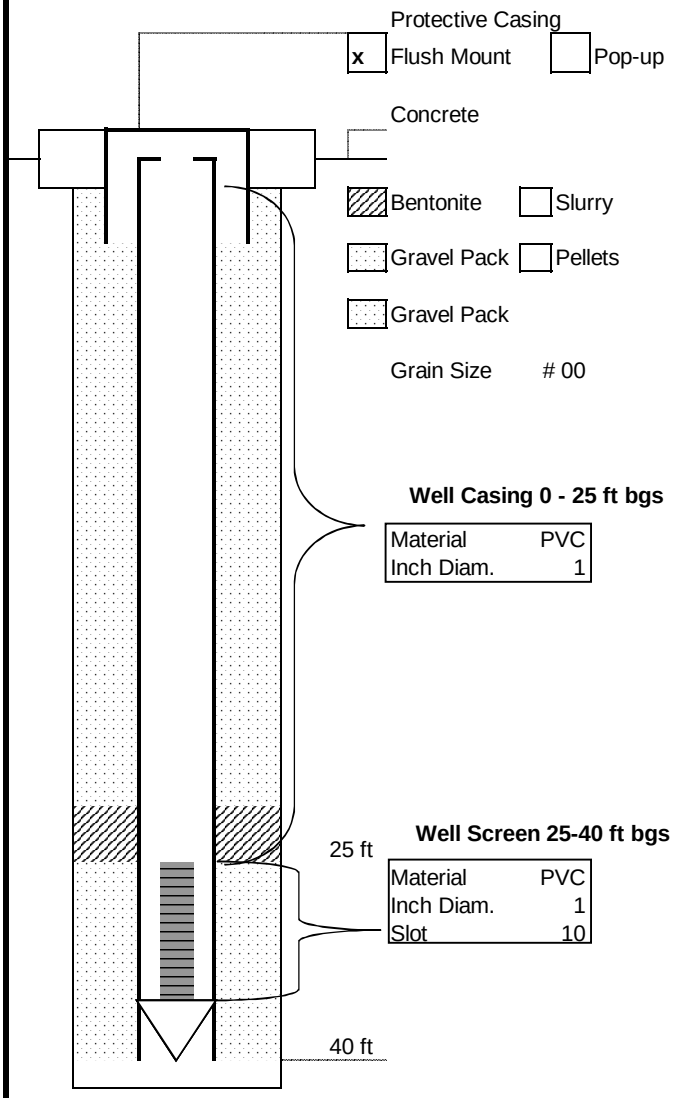
Company Name: EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

14MW-3



Note: Drawing is not to scale.
Depths are given in feet below land surface.

Monitoring Well No.: 14MW3

Project: 845 Grand Street, Brooklyn, NY

Location:
Located approximately mid way down Grand Street sidewalk, immediately in front of the new apartment building.

Depth to Groundwater: 31ft Date: 10/15/2015

Installation Depth: 40ftbg

Survey Point Elevation:

Installation Date: 10/6/2015

Drilling Contractor: Eastern Environmental Solutions, Inc.

Installation Method: Geoprobe - Hollow-Stem Auger

Water Removed During Development:

Hydrogeologist: Kevin Waters

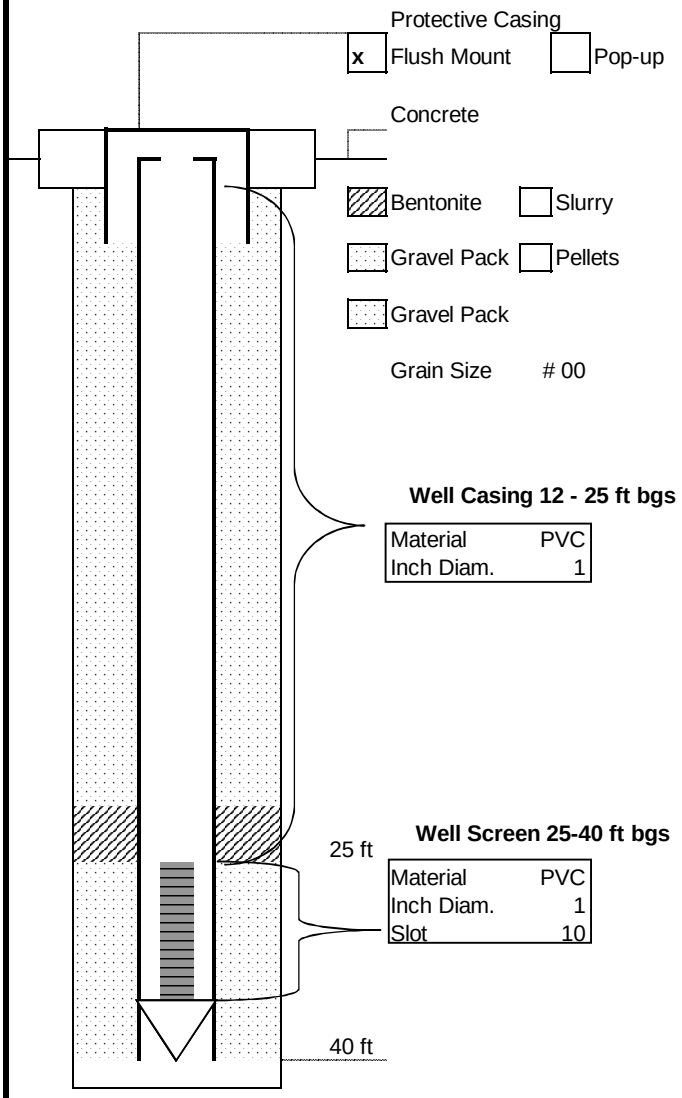
Company Name: EBC

GROUNDWATER MONITORING WELL

ENVIRONMENTAL BUSINESS CONSULTANTS

CONSTRUCTION LOG

14MW-4



Note: Drawing is not to scale.
Depths are given in feet below land surface.

Monitoring Well No.: 14MW4

Project: 845 Grand Street, Brooklyn, NY

Location: Located in the northeast corner of the cellar level rear courtyard.

Depth to Groundwater: 31ft Date: 10/15/2015

Installation Depth: 40ftbg

Survey Point Elevation:

Installation Date: 7/7/2015

Drilling Contractor: Aquifer Drilling & Testing, Inc.

Installation Method: Geoprobe - Hollow-Stem Auger

Water Removed During Development:

Hydrogeologist: Kevin Waters

Company Name: EBC

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

B1 Boring Log

Location: Performed 34.5' from the east property line and 8' south of the building (in the parking lot).				Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: EXB1301	Address: 845 Grand Street, Brooklyn, NY			Date / DTW	Ground Elevation
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe				Well Specifications
Date Started: 6/7/2013	Date Completed: 6/7/2013				None
Completion Depth: 15 feet	Geologist Dominick Mosca				

B1 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	0		0.0	No Recovery. Rock in shoe.
	5 to 10	32		0.0	2" - Concrete. 18" - Brown moist silt sand. 10" - Large stone followed by firm brown silty sand. Coarse gravel. No PID, No unusual odors.
	10 to 15	30		10.0	30" - Brown silty sand and coarse gravel. Petroleum odor with a low PID reading **Retained soil sample B1(10-13)*

Geologic Boring Log Details

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

B2 Boring Log

Location: Performed Northeast of the former B2 location. On the sidewalk of the building entrance.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: EXB1301	Address: 845 Grand Street, Brooklyn, NY		Date / DTW	Ground Elevation
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 6/7/2013	Date Completed: 6/7/2013			None
Completion Depth: 15	Geologist Dominick Mosca			

B2 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	0		0.0	No recovery.
	to 10	40		0.0	40" - Brown firm silty sand. 4" layer of concrete @ 6'.
	to 15	28		10	6" - Red stone/brick. 22" - Brown silty sand with a slight petroleum odor. **Retained soil sample B2(13-15)*

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB1

Location: Performed in the NW corner of the rear building.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW: Groundwater depth	Ground Elevation
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/18/2014	Date Completed: 3/18/2014			None
Completion Depth: 15 feet	Geologist: Kevin Brussee			

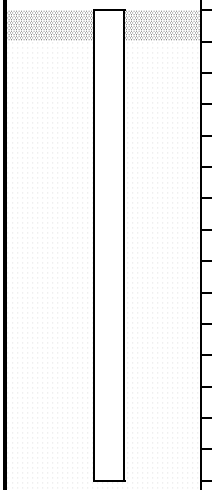
SB1 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	24		0.0	4" - Concrete. 3" - dark brown/black sandy silt. 1" - Concrete. 16" - Brown sandy silt.
	5 to 10	40		0.0	40" - Damp brown sandy silt.
	10 to 15	60		0.0	60" - Brown sandy silt. **Retained soil sample SB1(12-14)*

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB2

Location: Performed in the NE corner of the building.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW: Groundwater depth	Ground Elevation
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/18/2014	Date Completed: 3/18/2014			None
Completion Depth: 15 feet	Geologist Kevin Waters			

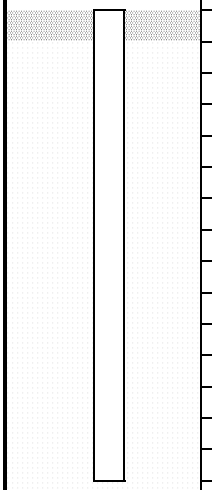
SB2 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	Blow per 6 in.	PID (ppm)	SOIL DESCRIPTION
	0 to 5	18		0.0	4" - Concrete. 14" - Brown fine sand. No odor.
	5 to 10	24		0.0	24" - Brown fine sand.
	10 to 15	30		0.0	30" - Brown sandy silt with rock. **Retained soil sample SB2(12-14)*

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB3

Location: Performed in the center/eastern side of the building.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW: Groundwater depth	Ground Elevation
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/18/2014	Date Completed: 3/18/2014			None
Completion Depth: 15 feet	Geologist: Kevin Waters			

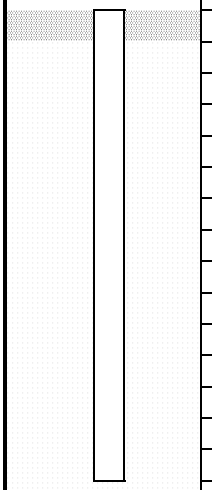
SB3 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	SAMPLES Blow per 6 in.	SAMPLES PID (ppm)	SOIL DESCRIPTION
	0 to 5	36		0.0	4" - Concrete. 32" - Brown sandy silt. No odor.
	5 to 10	40		0.0	40" - Brown sandy silt with some gravel.
	10 to 15	40		0.0	40" - Brown sandy silt with some gravel. **Retained soil sample SB3(12-14)*

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB4

Location: Performed in the middle/SW corner of the laundry building.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/18/2014	Date Completed: 3/18/2014			None
Completion Depth: 15 feet	Geologist Kevin Brussee			

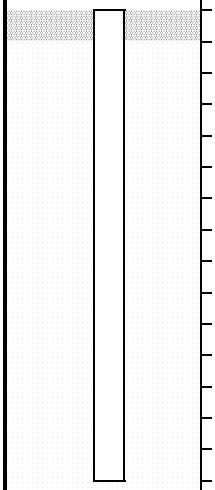
SB4 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	Blow per 6 in.	PID (ppm)	SOIL DESCRIPTION
	0 to 5	22		0.0	4" - Concrete. 4" - dark brown silty sand. 3" - Concrete. 6" - Dark brown sandy silt. 5" - Brown sandy silt.
	5 to 10	42		0.0	4" - Dark brown sandy silt. 38" - Damp brown sandy loam.
	10 to 15	46		0.0	44" - Brown sandy loam. 2" - Crushed stone. **Retained soil sample SB4(12-14)*

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB5

Location: Performed in the middle/SW corner of the laundry building.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/18/2014	Date Completed: 3/18/2014			None
Completion Depth: 15 feet	Geologist Kevin Brussee			

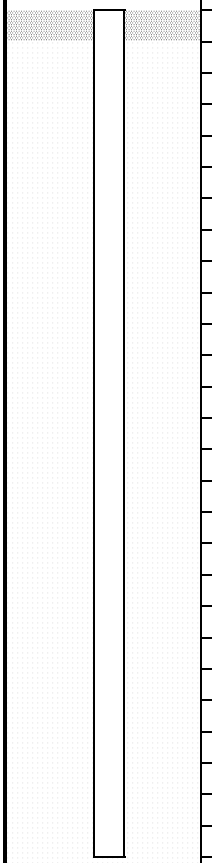
SB5 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	Blow per 6 in.	PID (ppm)	SOIL DESCRIPTION
	0 to 5	16		0.0	4" - Concrete. 6" - dark brown silty sand. 3" - Concrete. 3" - Historic fill.
	5 to 10	18		0.0	2" - Historic fill. 16" - Brown sandy clay with some grey mottling.
	10 to 15	48		0.0	48" - Brown sandy clay. **Retained soil sample SB5(12-14)*

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB6

Location: Performed 6' inside the building, immediately infront of the double doors.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/18/2014	Date Completed: 3/18/2014			None
Completion Depth: 27 feet	Geologist Kevin Brussee			

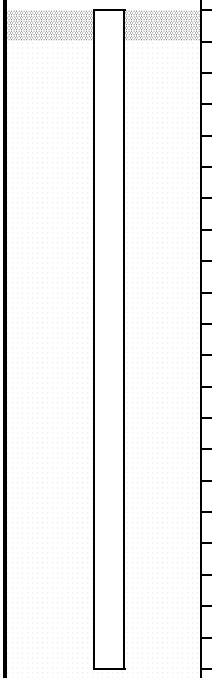
SB6 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	Blow per 6 in.	PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	28		0.0	4" - Concrete. 5" - Black silty sand. 3" - Concrete. 17" - Brown silty sand.
	to 10	48		0.0	48" - Brown clayey sand.
	to 15	50		0.0	50" - Brown clayey sand. **Retained soil sample SB6(12-14)*
	to 20	60		0.0	60" - Brown sandy clay.
	to 25	30		0.0	30" - Brown sandy clay with rock in shoe.
	to 27	15		0-2,040	12" - Brown silty sand 3" - Black stained sand with petroleum odor. **Retained soil sample SB6(25-26) and SB6 (26-27).*

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB7

Location: Performed in eastern side of existing building.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW: Groundwater depth	Ground Elevation
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/24/2014	Date Completed: 3/24/2014			None
Completion Depth: 21 feet	Geologist Dominick Mosca			

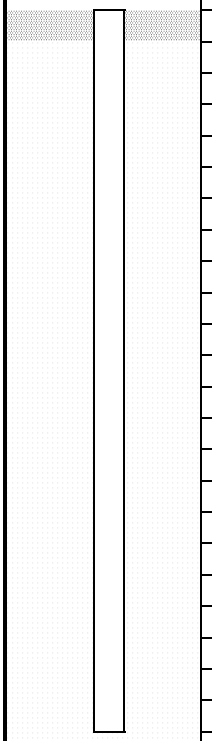
SB7 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	Blow per 6 in.	PID (ppm)	SOIL DESCRIPTION
	0 to 5	26		0.0	10" - Concrete. 16" - Red-brown fine to medium silty sand.
	5 to 10	40		0.0	10" - Firm dark brown silty sand. 1" - Stone. 10" - Firm brown silty sand. 19" - Brown sandy loam with coarse gravel.
	10 to 15	42		0-1	3" - Firm brown silty sand and coarse gravel. **Retained soil sample SB7(12-14)*
	15 to 20	28		0-2	28" - Firm brown silty sand and coarse gravel. **Retained soil sample SB7(19-21)*
	20 21	4"		0.0	4" - Firm brown silty sand and coarse gravel. Refusal at 21'.

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB8

Location: Performed 13' southeast of SB9, immediately east of the front double doors. 6' from sidewalk.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW	Ground Elevation
			Groundwater depth	
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/18/2014	Date Completed: 3/18/2014			None
Completion Depth: 23 feet	Geologist Dominick Mosca			

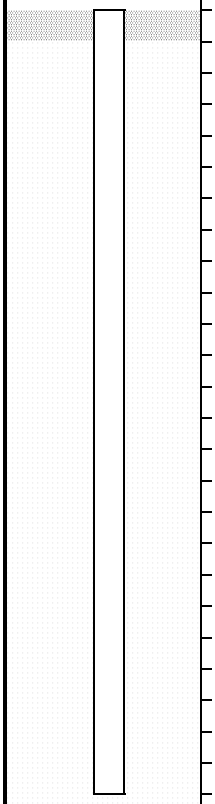
SB8 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	Blow per 6 in.	PID (ppm)	SOIL DESCRIPTION
	0				
	to 5	0		0.0	No recovery.
	to 10	36		0.0	36" - Brown fine, damp silty sand.
	to 15	28		27.2	28" - Brown sandy silt. Slight odor, PID 27.2 **Retained soil sample SB8(12-14)*
	to 20	40		0-2	40" - Brown silty sand. No odor, No PID.
	to 23				Refusal at 23'. No recovery.

Geologic Boring Log Details

ENVIRONMENTAL BUSINESS CONSULTANTS

SB9

Location: Performed in eastern side of existing building.			Depth to Water (ft. from grade.)	Site Elevation Datum
Site Name: UDI1301	Address: 845 Grand Street, Brooklyn, New York		Date / DTW: Groundwater depth	Ground Elevation
Drilling Company: Eastern Environmental Solutions	Method: Geoprobe			Well Specifications
Date Started: 3/18/2014	Date Completed: 3/18/2014			None
Completion Depth: 25 feet	Geologist Dominick Mosca			

SB9 (NTS)	DEPTH (ft below grade)	SAMPLES Recovery (in.)	Blow per 6 in.	PID (ppm)	SOIL DESCRIPTION
	0 to 5	26		0.0	10" - Concrete. 14" - Fine brown sand.
	5 to 10	46		0.0	46" - Fine brown sand.
	10 to 15	42		0-1,440	30" - Fine brown silty sand with some crushed stone. PID 0.0 12" - Fine brown silty sand with petroleum odor and PID of 1440 ppm. **Retained soil sample SB9(12-14) and SB9 (15).*
	15 to 20	20		8-1,100	20" - Fine brown silty sand with crushed stone.
	20 to 25	46		0.0	5" - Brown sand with gravel. 8" - Brown silty sand with crushed gravel. 3" - Brown sand with gravel, 3" crushed stone. 25" - Brown silty sand. **Retained soil sample SB9(25)*

ATTACHMENT E
FIELD SAMPLING PLAN

FORMER BENNETT TRUCKING CORP.

845 GRAND STREET, BROOKLYN, NEW YORK
Block 2922 Lot 47

FIELD SAMPLING PLAN

Prepared For:
845 Grand Development LLC
211 Hayes Avenue, Unit 201
Monroe, NY 10950

Prepared by:

EBC
ENVIRONMENTAL BUSINESS CONSULTANTS
1808 Middle Country Road
Ridge, NY 11961

JULY 2015

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FORMER BENNETT TRUCKING CORP.
FIELD SAMPLING PLAN

FIGURES

APPENDICES

1.0 INTRODUCTION

The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), Site No. C224181 which is administered by New York State Department of Environmental Conservation (NYSDEC). The Site is located in Brooklyn, Kings County, New York and is identified as Section 1900 Block 2922 and Lot 47 on the Brooklyn Tax Map. The Site is an approximately 0.19-acre area and is bounded by a 7-story apartment building (Block 2922, Lot 3 – 75 Bushwick Avenue) with a parking area to the north and west, a three-story apartment building with a 1st floor store (Block 2292, lot 46 – 855 Grand Street) to the east, and Grand Street to the south.

A Site Management Plan (SMP) has been prepared for the Site. This SMP was prepared to manage the remaining VOC contamination detected in on-site groundwater until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. The SMP has been approved by the NYSDEC, and compliance with the SMP is required by the grantor of the Environmental Easement and the grantor's successors and assigns. The SMP may only be revised with the approval of the NYSDEC.

1.1 Background

1.1.1 Remedial Investigation

A Remedial Investigation consisting of soil, groundwater and soil vapor sampling was performed at the Site in 2014.

A total of 9 soil borings (SB1 through SB9) were performed to identify source areas and to obtain general soil quality information at the Site. Gasoline related volatile organic compounds were detected above Unrestricted Use SCOs and Restricted Residential Use SCOs (1,2,4-trimethylbenzene in SB6) within the soil sample retained from immediately above the groundwater table (26 to 27ft) from soil boring SB6. Gasoline related VOCs were also detected above Unrestricted Use SCOs within soil sample SB(15ft). Soil borings SB6 and SB9 were performed in the approximate area of the underground gasoline tank.

Three groundwater monitoring wells (MW1, MW3 and MW5) were installed and groundwater samples were collected from each of them. Gasoline related VOCs were detected above GQS in two of the three monitoring wells (MW3 and MW5). Total VOC concentrations ranged from 125 µg/L (MW1) to 6,046 µg/L (MW5). The concentrations of petroleum related VOCs within groundwater were highest at the most up gradient well location, MW5, as well as immediately down gradient of the source area, GW1 (prior Phase II). The chlorinated VOCs cis-1,2-dichloroethene and trichloroethene were detected in one or more of the groundwater sampling locations, but all at a concentration below GQS.

To assess the presence of VOCs in soil vapor beneath the site, six soil vapor samples (SG1-SG6) were collected at the site from a depth of approximately 12 feet below grade. Multiple VOCs were detected above the laboratory method detection limit in each of the six soil gas samples. BTEX concentrations were generally low across the Site ranging in concentration from 4.65 µg/m^3 to 1,243.8 µg/m^3 in SG6. The highest concentrations of BTEX compounds were detected in the southeast corner of the property.

There is no correlation between the identified source area and petroleum VOCs in soil gas as some of the lowest concentrations reported were in SG4 located adjacent to the source area.

Chlorinated VOCs (CVOCs) were reported in all soil gas samples at concentration below NYSDOH Guidance Values, with the exception of trichloroethene (TCE) which was detected at a concentration of 14.8 $\mu g/m^3$ in sample SG4, located in the south central area of the Site.

1.1.2 Remedial Action

The former underground gasoline tank has been removed, and petroleum contaminated soil has been excavated from the source area to a depth of approximately 15 feet below grade. The remainder of the Site was excavated to a depth of approximately 12 feet below grade for construction of a new building.

Following Site excavation, eight injection wells and four monitoring wells were installed. Injections of a chemical oxidant into the eight injection wells have been performed to remediate the petroleum contaminated groundwater. The four monitoring wells have been installed to allow for collection of groundwater samples to monitor the effectiveness of the chemical oxidant injections.

2.0 FIELD SAMPLING PLAN

One on-site monitoring well (14MW4) and three off-site monitoring wells (14MW1, 14MW2 and 14MW3) are located at the Site. The monitoring wells were installed to evaluate the performance of the remedial effort and monitor improvements to groundwater quality.

Each of the monitoring wells are constructed of 1-inch diameter pvc casing and 0.010 inch slotted pvc well screen. The wells have 15 feet of screen from approximately 40 to 25 feet below grade. A No. 00 Morie or equivalent filer sand is installed in the borehole to within 2 feet above the top of the screen. A 1-foot hydrated bentonite seal was placed on top of the filter sand and the remainder of the borehole was backfilled to grade.

2.1 Groundwater Sampling

Groundwater samples will be collected from all four monitoring wells. Sample procurement will be achieved through the use of dedicated polyethylene tubing, and a peristaltic pump. The location of the monitoring wells is shown on **Figure 1**.

All groundwater sampling activities will be recorded in the project dedicated field book. This will include a description of:

- Date and time of sample collection
- Sample location
- Purging time, duration and volume;
- Sample appearance
- Analytical methodology:

Groundwater samples will be collected using a peristaltic pump equipped with disposable pump head tubing and disposable polyethylene tubing. Groundwater sampling is to be performed in accordance with standard low-flow sampling procedures as follows:

- Record pump make & model on sampling form.
- Wear appropriate health and safety equipment as outlined in the Health and Safety Plan
- Inspect each well for any damage or evidence of tampering and note condition in field logbook.
- Remove the well cap
- Lay out plastic sheeting and place the monitoring, purging and sampling equipment on the sheeting.
- To avoid cross-contamination, do not let any downhole equipment touch the ground.
- Measure well headspace with a PID or FID and record the reading in the field logbook.
- A synoptic water level measurement round should be performed (in the shortest possible time) before any purging and sampling activities begin. Measure and record the depth to water using a water level meter or interface probe to the nearest 0.01 ft. Record the measurement in the field logbook. Do not measure the depth to the bottom of the well at this time (to avoid disturbing any sediment that may have accumulated). Obtain depth to bottom information from installation information in the field logbook or soil boring logs.

- Collect samples in order from wells with lowest contaminant concentration to highest concentration.
- Connect the polyethylene tubing to the peristaltic pump and lower the tubing into the well to approximately the middle of the screen. The pump should be a minimum of 2 feet above the bottom of the well as this may cause mobilization of any sediment present in the bottom of the well.
- Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no water level drawdown (less than 0.3 feet). If the minimal drawdown that can be achieved exceeds 0.3 feet but remains stable, continue purging until indicator field parameters stabilize.
- There should be at least 1 foot of water over the top of the pump so there is no risk of entrapment of air in the sample. Pumping rates should be reduced to the minimum capabilities of the pump, if needed, to avoid purging the well dry. However, if the recharge rate of the well is very low and the well is purged dry, then wait until the well has recharged to a sufficient level and collect the appropriate volume of sample.
- During well purging, monitor indicator field parameters (temperature, specific conductance, pH and turbidity) every three to five minutes (or less frequently, if appropriate) and record on a groundwater sampling log (Appendix A). Note: during the early phase of purging emphasis should be put on minimizing and stabilizing pumping stress, and recording those adjustments. Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, taken at three (3) to five (5) minute intervals, are within the following limits:
  - specific conductance (3%),
  - temperature (3%),
  - pH (± 0.1 unit)
  - turbidity (≤50 ntu)
  - If stability is not reached within a reasonable time period purging may be stopped and the sample collected. This should be noted on the sampling log.
- VOC samples should be collected directly into pre-preserved sample containers. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Fill each container with sample to just overflowing so that no air bubbles are entrapped inside. Cap each bottle as it is filled.
- Label the samples, and record them on the chain of custody form (template COC provided in **Appendix B**). Place immediately into a cooler for shipment and maintain at 4^{o}C.
- Remove the tubing from the well. The polyethylene tubing must either be dedicated to each well or discarded. If dedicated the tubing should be placed in a large plastic garbage bag, sealed, and labeled with the appropriate well identification number.
- Close and lock the well.
- Decontaminate pump either by changing the surgical pump tubing between wells or as follows:
  1. Flush the equipment/pump with potable water.
  2. Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.
  3. Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

4. Flush with isopropyl alcohol (pesticide grade). If equipment blank data from the previous sampling event show that the level of contaminants is insignificant, then this step may be skipped.
5. Flush with distilled/deionized water. The final water rinse must not be recycled.

Samples will be collected in pre-cleaned laboratory supplied glassware, stored in a cooler with ice and submitted to a New York State ELAP certified environmental laboratory. Groundwater samples from each monitoring well will be submitted for laboratory analysis of VOCs.

All monitoring wells will be surveyed to determine relative casing elevation to the nearest 0.01 ft and horizontal position to the nearest 0.1ft. Survey data will be used to determine the direction and gradient of groundwater flow at the Site.

2.2 Groundwater Sample QA/QC

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or cold-pak(s) to maintain a temperature of 4oC.

Dedicated disposable sampling materials will be used for groundwater samples, eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, field rinsate blanks will be prepared at the rate of 1 for every eight samples collected.

Each groundwater sample will be properly labeled and documented on the Chain of Custody and within the bound log book, placed in a zip-lock plastic bag and placed in a cooler with ice to maintain a temperature of 4^{o}C, until pickup by the sample courier. Courier service is provided by Phoenix Environmental Laboratories, Inc. Sample receipt by the laboratory (Phoenix Environmental Laboratories, Inc.) shall be considered as signed receipt by Phoenix Environmental Laboratories, Inc. courier.

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated. Laboratory specific QA/QC information is provided within the QAPP.

2.3 Sampling Documentation Requirements

All sample jars will be marked and identified with a legible sample label which shall indicate (1) project address (845 Grand Street), (2) sample location (14MW1, 14MW2, etc.), (3) the date and time the sample was collected, (4) and any preservative(s) utilized (HCL/ice). Additional sample information may be marked on the sample label and/or Chain of Custody if needed. Chain of Custody shall be tracked from laboratory issuance of sample containers through laboratory receipt of the samples.

A bound sample logbook will be maintained by EBC during sampling collection activities. The following information will be recorded (at a minimum) within the log book:

a) Sample Identification Number
b) Sample Location
c) Field Observations
d) Sample type
e) Analyses
f) Date and time of collection
g) Collector's name
h) Sample procedures and equipment utilized
i) Date sent to laboratory and name of laboratory

2.4 Analytical Methodology

Sample analysis will be provided by a New York State certified environmental laboratory; Phoenix Environmental Laboratories, Inc. of Manchester, Connecticut (NYSDOH Lab I.D. No. 11301). Groundwater samples will be analyzed for the following parameters.

- Volatile organic Compounds (VOCs) by EPA Method 8260.

2.5 Investigation-Derived Waste Handling Procedure

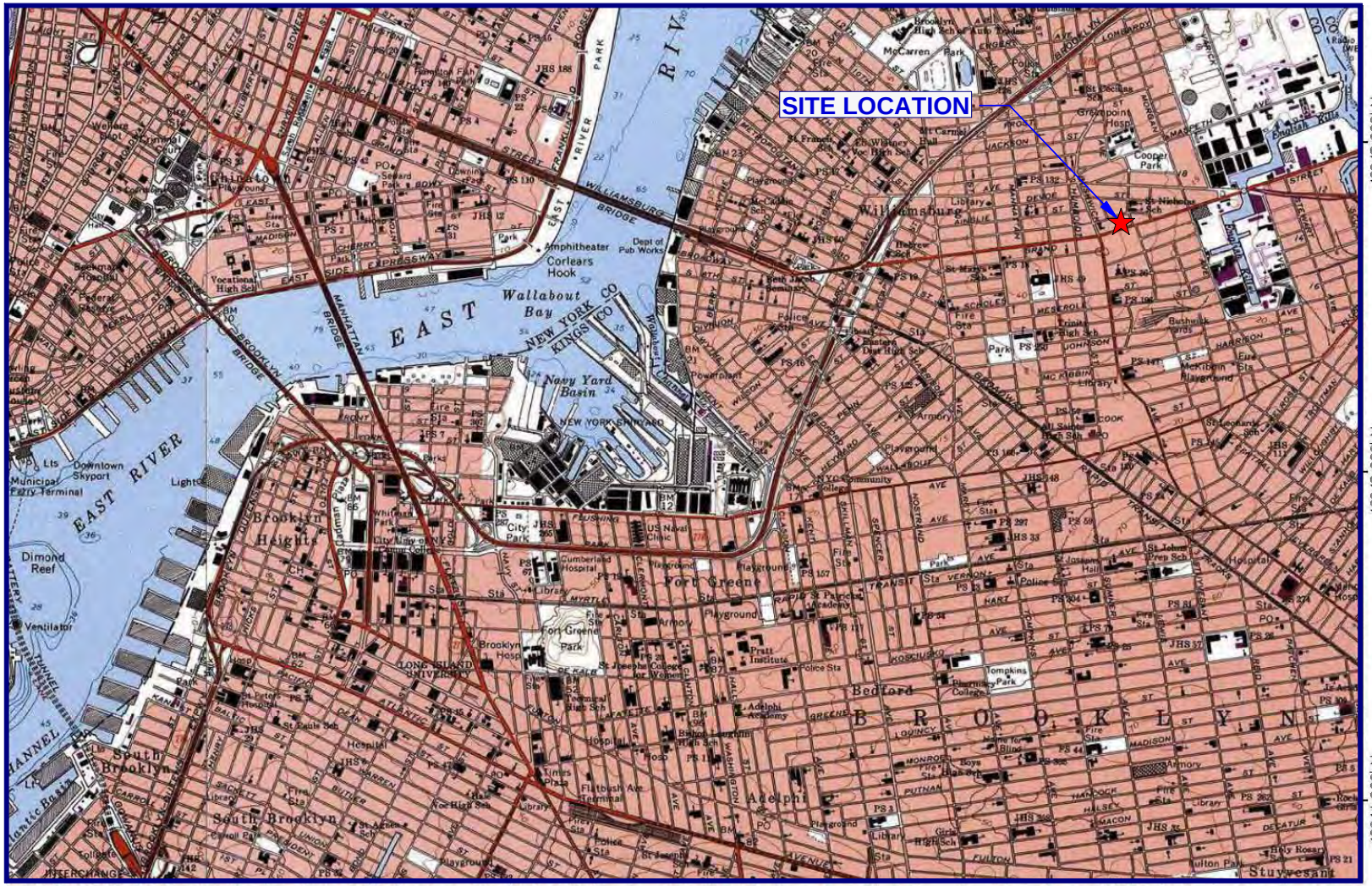
Investigation derived wastes that will be generated during groundwater sampling at the Site will consist of the following: groundwater, decontamination fluids, PPE and other miscellaneous disposables. Groundwater purged from the monitoring wells and all decontamination fluids are to be containerized in USDOT-approved 55-gallon drums. Each drum is to be labeled with a "Non-Hazardous Waste" label **(Appendix C)** which is to be affixed to the side of the drum. The following information must be written on each label.

Shipper: 845 Grand Development LLC
Address: 845 Grand Street
City, State, Zip: Brooklyn, NY 11211
Contents: Non-Hazardous, Non-RCRA Regulated Liquid
Emergency Contact: Kevin Brussee – Environmental Business Consultants – 631.504.6000

After each drum is filled or at completion of work, each drum must be securely closed and stored within the new building until waste characterization sampling has been performed. Final classification and disposal of purge water will be based on the results of this analysis and upon approval of the NYSDEC Project Manager.

All PPE and other miscellaneous sampling disposables (polyethylene tubing, plastic sheeting) shall be placed in a plastic garbage bag and disposed in the on-site dumpster.

FIGURES



USGS Brooklyn Quadrangle 1995, Contour Interval = 10 feet

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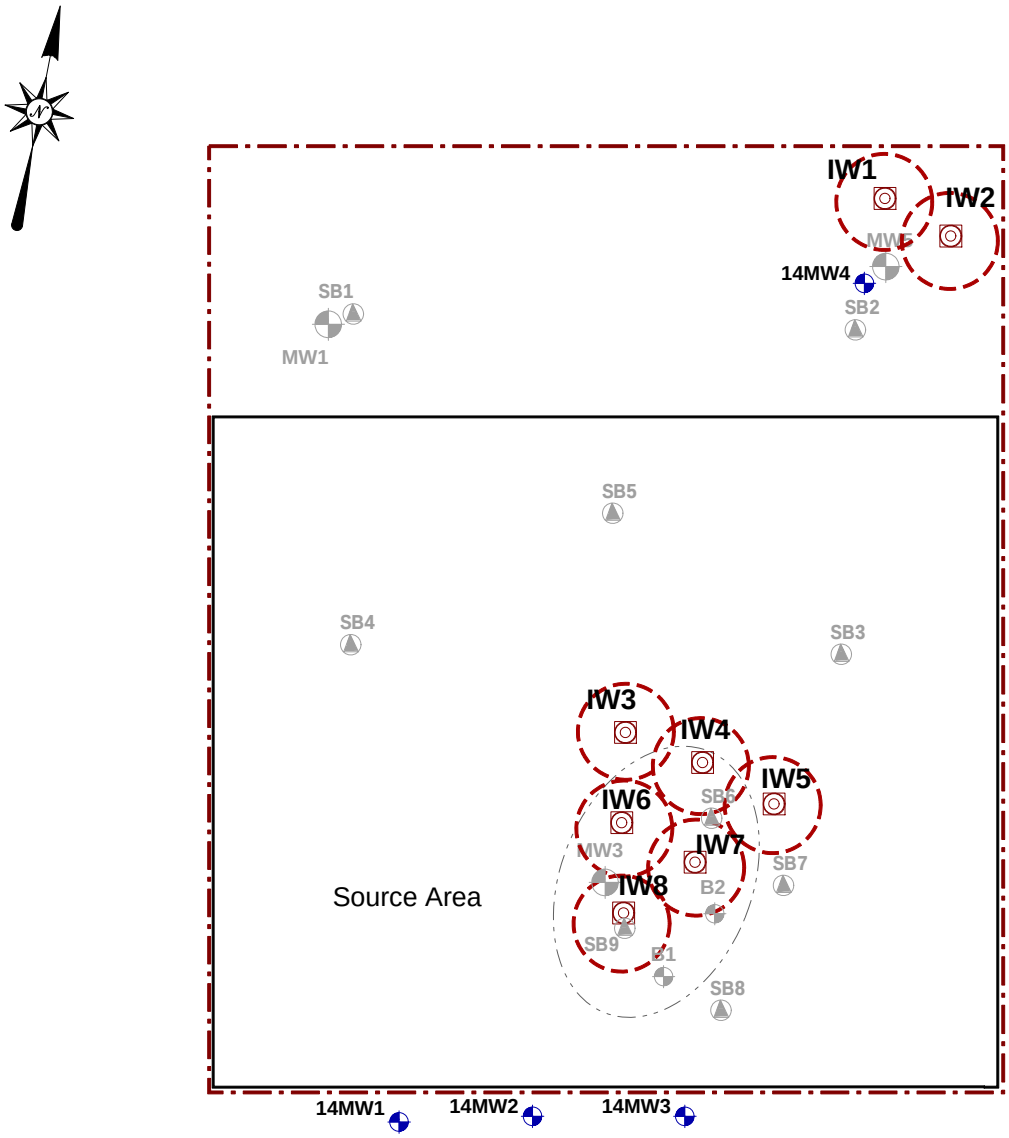
845 GRAND STREET
BROOKLYN, NY

FIGURE 1 SITE LOCATION MAP



KEY

- Property Line
- SBx — RI Boring Location
- MWx — RI Well Location
- **MWx** — Proposed Performance Well Location
- **IWx** — Oxidant Injection Well

0 10 20

Scale: 1 inch = 20 feet

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845 GRAND STREET
BROOKLYN, NY 11211

FIGURE 15 PROPOSED INJECTION / MONITORING WELL LOCATIONS

APPENDIX A
SAMPLE GW SAMPLING LOG

GROUNDWATER PURGE / SAMPLE LOGS

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

Well I.D.: _____ Date: _____

Well Depth (from TOC): _____ Equipment: _____

Static Water Level (from TOC): _____

Height of Water in Well: 0

Gallons of Water per Well Volume: 0

Flow Rate: 400ml/min.

Time	Pump Rate	Gal. Removed	pH	Cond. (mS/cm)	Temp. (deg. C)	DO (mg/L)	Comments

Note 400 ml = 0.11 gallons

APPENDIX B
SAMPLE CHAIN OF CUSTODY

Cooler: Yes ☐ No ☐
Coolant: IPK ☐ ICE ☐ No ☐

NY/NJ CHAIN OF CUSTODY RECORD

Temp ° C Pg of

PHOENIX Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: info@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-8726

Contact Options:
☐ Fax: _____
☐ Phone: _____
☐ Email: _____

Customer: _____ Project: _____ Project P.O: _____
Address: _____ Report to: _____
_____ Invoice to: _____

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature _____ Date: _____

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE=**Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe
OIL=Oil **B**=Bulk **L**=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	Soil VOA Vials [ ] methanol [ ] H2O	GL Soil container ( ) oz	GL Soil container ( ) oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] H2SO4	PL As is [ ] 250ml [ ] 500ml [ ] 1000ml	PL H2SO4 [ ] 250ml [ ] 500ml	PL HNO3 250ml	PL NaOH 250ml	Bacteria Bottle

Relinquished by:	Accepted by:	Date:	Time:

Comments, Special Requirements or Regulations:

Turnaround:
☐ 1 Day*
☐ 2 Days*
☐ 3 Days*
☐ 5 Days
☐ 10 Days
Other

*** SURCHARGE APPLIES**

NJ
☐ Res. Criteria
☐ Non-Res. Criteria
☐ Impact to GW Soil Cleanup Criteria
☐ GW Criteria

NY
☐ TOGS GW
☐ CP-51 SOIL
☐ 375SCO Unrestricted Soil
☐ 375SCO Residential Soil
☐ 375SCO Residential Restricted Soil
☐ 375SCO Commercial Soil
☐ 375SCO Industrial Soil

Data Format
☐ Phoenix Std Report
☐ Excel
☐ PDF
☐ GIS/Key
☐ EQuIS
☐ NJ Hazsite EDD
☐ NY EZ EDD (ASP)
☐ Other

State where samples were collected: _____

Data Package
☐ NJ Reduced Deliv. *
☐ NY Enhanced (ASP B) *
☐ Other

APPENDIX C
SAMPLE DRUM LABEL


NON-
HAZARDOUS
WASTE
GENERATOR INFORMATION (Optional)
SHIPPER
ADDRESS
CITY, STATE, ZIP
CONTENTS
NON-HAZARDOUS WASTE

ATTACHMENT F
QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN
Former Bennett Trucking Corp.
845 Grand Street, Brooklyn, NY

Prepared on behalf of:

845 Grand Development LLC
211 Hayes Avenue, Unit 201
Monroe, NY 10950

Prepared by:

EBC
Environmental Business Consultants
Ridge, NY 11961

TABLE OF CONTENTS

QUALITY ASSURANCE PROJECT PLAN

Former Bennett Trucking Corp. Site
845 Grand Street, Brooklyn, NY

TABLES

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared in accordance with DER-10 to detail procedures to be followed during the course of the sampling and analytical portion of the Site Management Plan.

To ensure the successful completion of the project each individual responsible for a given component of the project must be aware of the quality assurance objectives of his / her particular work and of the overall project. The EBC Project Director, Charles Sosik will be directly responsible to the client for the overall project conduct and quality assurance/quality control (QA/QC) for the project. The Project Director will be responsible for overseeing all technical and administrative aspects of the project and for directing QA/QC activities. As Project Director Mr. Sosik will also serve as the Quality Assurance Officer (QAO) and in this role may conduct:

- conduct periodic field and sampling audits;
- interface with the analytical laboratory to resolve problems; and
- interface with the data validator and/or the preparer of the DUSR to resolve problems.

Kevin Brussee will serve as the Project Manager and will be responsible for implementation of each groundwater sampling event and coordination with field sampling crews and subcontractors. Reporting directly to the Project Manager will be the Field Operations Officer, Kevin Waters; who will serve as the on-Site qualified environmental professional who will record observations, direct the sampling crew and be responsible for the collection and handling of all samples.

1.1 Organization

Project QA will be maintained under the direction of the Project Manager, in accordance with this QAPP. QC for specific tasks will be the responsibility of the individuals and organizations listed below, under the direction and coordination of the Project Manager

.

GENERAL RESPONSIBILITY	SCOPE OF WORK	RESPONSIBILITY OF QUALITY CONTROL
Field Operations	Supervision of Field Crew, sample collection and handling	Kevin Waters, EBC
Project Manager	Implementation of each of the quarterly groundwater sampling events specified in the Site Management Plan	Kevin Brussee, EBC
Laboratory Analysis	Analysis of groundwater samples by NYSDEC ASP methods Laboratory	NYSDOH-Certified Laboratory
Data review	Review for completeness and compliance	3rd party validation

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2.0 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES

2.1 Overview

Overall project goals are defined through the development of Data Quality Objectives (DQOs), which are qualitative and quantitative Statements that specify the quality of the data required to support decisions; DQOs, as described in this section, are based on the end uses of the data as described in the work plan.

In this plan, Quality Assurance and Quality Control are defined as follows:

- Quality Assurance - The overall integrated program for assuring reliability of monitoring and measurement data.

- Quality Control - The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

2.2 QA / QC Requirements for Analytical Laboratory

Samples will be analyzed by a New York State Department of Health (NYSDOH) certified laboratory. Data generated from the laboratory will be used to evaluate contaminants such as metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and pesticides / PCBs in groundwater. The QA requirements for all subcontracted analytical laboratory work performed on this project are described below. QA elements to be evaluated include accuracy, precision, sensitivity, representativeness, and completeness. The data generated by the analytical laboratory for this project are required to be sensitive enough to achieve detection levels low enough to meet required quantification limits as specified in NYSDEC Analytical Services Protocol (NYSDEC ASP, 07/2005. The analytical results meeting the required quantification limits will provide data sensitive enough to meet the data quality objectives of this remedial program as described in the work plan. Reporting of the data must be clear, concise, and comprehensive. The QC elements that are important to this project are completeness of field data, sample custody, sample holding times, sample preservation, sample storage, instrument calibration and blank contamination.

2.2.1 Instrument Calibration

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of NYSDEC ASP 07/2005).

2.2.2 Continuing Instrument Calibration

The initial calibration curve will be verified every 12 hrs by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

2.2.3 Method Blanks

Method blank or preparation blank is prepared from an analyte·free matrix which includes the same reagents, internal standards and surrogate standards as me related samples. II is carried through the

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entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12 hr period during the analysis of samples for volatiles. An acceptable method blank will contain less than two (2) times the CRQL of methylene chloride, acetone and 2-butanone. For all other target compounds, the method blank must contain less than or equal to the CRQL of any single target compound. For non-target peaks in the method blank, the peak area must be less than 10 percent of the nearest internal standard. The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

2.2.4 Trip Blanks

Trip blanks consist of a single set of sample containers filled at the laboratory with deionized laboratory-grade water. The water used will be from the same source as that used for the laboratory method blank. The containers will be carried into the field and handled and transported in the same way as the samples collected that day. Analysis of the trip blank for VOCs is used to identify contamination from the air, shipping containers, or from other items coming in contact with the sample bottles. (The bottles holding the trip blanks will be not opened during this procedure.) A complete set of trip blanks will be provided with each shipment of samples to the certified laboratory.

2.2.5 Surrogate Spike Analysis

For organic analyses, all samples and blanks will be spiked with surrogate compounds before purging or extraction in order to monitor preparation and analyses of samples. Surrogate spike recoveries shall fall within the advisory limits in accordance with the NY5DEC ASP protocols for samples falling within the quantification limits without dilution.

2.2.6 Matrix Spike / Matrix Spike Duplicate / Matrix Spike Blank (MS/MSDIMSB) Analysis

MS, MSD and MSB analyses will be performed to evaluate the matrix effect of the sample upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS / MSD / MSB samples will be analyzed for each group of samples of a similar matrix at a rate of 5% (one for every 20 field samples). The RPD will be calculated from the difference between the MS and MSD. Matrix spike blank analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD.

2.3 Accuracy

Accuracy is defined as the nearness of a real or the mean (x) of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. Accuracy includes both precision and recovery and is expressed as percent recovery (% REC). The MS sample is used to determine the percent recovery. The matrix spike percent recovery (% REC) is calculated by the following equation:

$$\%REC = \frac{SSR - SR}{SA} \times 100$$

Where:
SSR = spike sample results
SR = sample results
SA = spike added from spiking mix

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2.4 Precision

Precision is defined as the measurement of agreement of a set of replicate results among themselves without a Precision is defined as the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analyses.

Analytical precision is expressed in terms of RPD. The RPD is calculated using the following formula:

$$RPD = \frac{D^1 - D^2}{(D^1 - D^2)/2} \times 100$$

Where:
RPD = relative percent difference
D^1 = first sample value
D^2 = second sample value (duplicate)

2.5 Sensitivity

The sensitivity objectives for this plan require that data generated by the analytical laboratory achieve quantification levels low enough to meet the required detection limits specified by NYSDEC ASP and to meet all site-specific standards, criteria and guidance values (SGCs) established for this project.

2.6 Representativeness

Representativeness is a measure of the relationship of an individual sample taken from a particular site to the remainder of that site and the relationship of a small aliquot of the sample (i.e., the one used in the actual analysis) to the sample remaining on site. The representativeness of samples is assured by adherence to sampling procedures described in the Remedial Investigation Work Plan.

2.7 Completeness

Completeness is a measure of the quantity of data obtained from a measurement system as compared to the amount of data expected from the measurement system. Completeness is defined as the percentage of all results that are not affected by failing QC qualifiers, and should be between 70 and 100% of all analyses performed. The objective of completeness in laboratory reporting is to provide a thorough data support package. The laboratory data package provides documentation of sample analysis and results in the form of summaries, QC data, and raw analytical data. The laboratory will be required to submit data packages that follow NYSDEC ASP reporting format which, at a minimum, will include the following components:

1. All sample chain-of-custody forms.
2. The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
3. Documentation demonstrating the laboratory's ability to attain the contract specified detection limits for all target analytes in all required matrices.
4. Tabulated target compound results and tentatively identified compounds.
5. Surrogate spike analysis results (organics).
6. Matrix spike/matrix spike duplicate/matrix spike blank results.
7. QC check sample and standard recovery results
8. Blank results (field, trip, and method).
9. Internal standard area and RT summary.

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2.8 Laboratory Custody Procedures

The following elements are important for maintaining the field custody of samples:

- Sample identification
- Sample labels
- Custody records
- Shipping records
- Packaging procedures

Sample labels will be attached to all sampling bottles before field activities begin; each label will contain an identifying number. Each number will have a suffix that identifies the site and where the sample was taken. Approximate sampling locations will be marked on a map with a description of the sample location. The number, type of sample, and sample identification will be entered into the field logbook. A chain-of-custody form, initiated at the analytical laboratory will accompany the sample bottles from the laboratory into the field. Upon receipt of the bottles and cooler, the sampler will sign and date the first received blank space. After each sample is collected and appropriately identified, entries will be made on the chain-of-custody form that will include:

- Site name and address
- Samplers' names and signatures

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3.0 ANALYTICAL PROCEDURES

3.1 Laboratory Analysis

Samples will be analyzed by the NYSDOH ELAP laboratory for one or more of the following parameters: VOCs in groundwater by USEPA Method 8260, SVOCs in groundwater by USEPA Method 8270BN. If any modifications or additions to the standard procedures are anticipated, and if any nonstandard sample preparation or analytical protocol is to be used, the modifications and the nonstandard protocol will be explicitly defined and documented. Prior approval by EBC's PM will be necessary for any nonstandard analytical or sample preparation protocol used by the laboratory, i.e., dilution of samples or extracts by greater than a factor of five (5).

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4.0 DATA REDUCTION, REVIEW, AND REPORTING

4.1 Overview

The process of data reduction, review, and reporting ensures the assessments or a conclusion based on the final data accurately reflects actual site conditions. This plan presents the specific procedures, methods, and format that will be employed for data reduction, review and reporting of each measurement parameter determined in the laboratory and field. Also described in this section is the process by which all data, reports, and work plans are proofed and checked for technical and numerical errors prior to final submission.

4.2 Data Reduction

Standard methods and references will be used as guidelines for data handling, reduction, validation, and reporting. All data for the project will be compiled and summarized with an independent verification at each step in the process to prevent transcription/typographical errors. Any computerized entry of data will also undergo verification review.

Sample analysis will be provided by a New York State certified environmental laboratory. Laboratory reports will include ASP category B deliverables for use in the preparation of a data usability summary report (DUSR). All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Analytical results shall be presented on standard NYSDEC ASP-B forms or equivalents, and include the dates the samples were received and analyzed, and the actual methodology used. Note that if waste characterization samples are analyzed they will be in results only format and will not be evaluated in the DUSR.

Laboratory QA/QC information required by the method protocols will be compiled, including the application of data QA/QC qualifiers as appropriate. In addition, laboratory worksheets, laboratory notebooks, chains-of-custody, instrument logs, standards records, calibration records, and maintenance records, as applicable, will be provided in the laboratory data packages to determine the validity of data. Specifics on internal laboratory data reduction protocols are identified in the laboratory's SOPs.

Following receipt of the laboratory analytical results by EBC, the data results will be compiled and presented in an appropriate tabular form. Where appropriate, the impacts of QA/QC qualifiers resulting from laboratory or external validation reviews will be assessed in terms of data usability.

4.3 Laboratory Data Reporting

All sample data packages submitted by the analytical laboratory will be required to be reported in conformance to the NYSDEC ASP (7/2005), Category B data deliverable requirements as applicable to the method utilized. All results will be provided in accordance with the NYSDEC Environmental Information Management System (EIMS) electronic data deliverable (EDD) format. Note that waste characterization samples if analyzed will be in results only format and will not be evaluated in the DUSR.

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5.0 CORRECTIVE ACTION

Review and implementation of systems and procedures may result in recommendations for corrective action. Any deviations from the specified procedures within approved project plans due to unexpected site-specific conditions shall warrant corrective action. All errors, deficiencies, or other problems shall be brought to the immediate attention of the EBC PM, who in turn shall contact the Quality Assurance/Data Quality Manager or his designee (if applicable).

Procedures have been established to ensure that conditions adverse to data quality are promptly investigated, evaluated and corrected. These procedures for review and implementation of a change are as follows:

- Define the problem.
- Investigate the cause of the problem.
- Develop a corrective action to eliminate the problem, in consultation with the personnel who defined the problem and who will implement the change.
- Complete the required form describing the change and its rationale (see below for form requirements).
- Obtain all required written approvals.
- Implement the corrective action.
- Verify that the change has eliminated the problem.

During each of the groundwater sampling events, all changes to the sampling program will be documented in field logs/sheets and the EBC PM advised.

If any problems occur with the laboratory or analyses, the laboratory must immediately notify the PM, who will consult with other project staff. All approved corrective actions shall be controlled and documented.

All corrective action documentation shall include an explanation of the problem and a proposed solution which will be maintained in the project file or associated logs. Each report must be approved by the necessary personnel (e.g., the PM) before implementation of the change occurs. The PM shall be responsible for controlling, tracking, implementing and distributing identified changes.

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TABLE 1
SUMMARY OF
SAMPLING PROGRAM RATIONALE AND ANALYSIS

Matrix	Location	Approximate Number of Samples	Rationale for Sampling	Laboratory Analysis
Groundwater (water table)	From 1 monitoring well located in the rear courtyard and three monitoring wells located in the sidewalk in front of the new building.	4	To evaluate the effectiveness of the in-site chemical oxidation injection program.	VOCs EPA Method 8260B, SVOCs EPA Method 8270
Total (Groundwater)		4		
MS/MSD	Matrix spike and Matrix spike duplicates at the rate 5%	1	To meet requirements of QA / QC program	1 MS/MSD for VOCs EPA Method 8260B and SVOCs EPA Method 8270 BN
Trip Blanks	One laboratory prepared trip blank to accompany samples each time they are delivered to the laboratory.	1	To meet requirements of QA / QC program	VOCs EPA Method 8260B
Total (QA / QC Samples)		2		

TABLE 2
SAMPLE COLLECTION AND ANALYSIS PROTOCOLS

Sample Type	Matrix	Sampling Device	Parameter	Sample Container	Sample Preservation	Analytical Method#	CRQL / MDLH	Holding Time
Groundwater	Water	Pump tubing	VOCs	(3) 40 ml vials	Cool to 4^{o} C	EPA Method 8260	Compound specific (1-5 ug/L)	14 days
Groundwater	Water	Pump tubing	SVOCs	(1) 1 Liter Amber Bottle	Cool to 4^{o} C	EPA Method 8270 BN	Compound specific (1-5 ug/L)	14 days

Notes:
All holding times listed are from Verified Time of Sample Receipt (VTSR) unless noted otherwise. * Holding time listed is from time of sample collection.
The number in parentheses in the "Sample Container" column denotes the number of containers needed.
Triple volume required when collected MS/MSD samples
The number of trip blanks are estimated.
CRQL / MDL = Contract Required Quantitation Limit / Method Detection Limit.
MCAWW = Methods for Chemical Analysis of Water and Wastes.
NA = Not available or not applicable.

ATTACHMENT G
HEALTH AND SAFETY PLAN

FORMER BENNETT TRUCKING CORP. SITE

845 GRAND STREET
BROOKLYN, NEW YORK

HEALTH AND SAFETY PLAN

JULY 2015

Prepared By:

EBC

ENVIRONMENTAL BUSINESS CONSULTANTS

1808 Middle Country Road
Ridge, NY 11961

HEALTH AND SAFETY PLAN

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Table of Contents (Continued)

FIGURES

APPENDICES

STATEMENT OF COMMITMENT

This Health and Safety Plan (HASP) has been prepared to ensure that workers are not exposed to risks from hazardous materials while performing chemical oxidant injections, sampling groundwater from the three monitoring wells installed within the sidewalk in front of the building and the one monitoring well installed on the Site, and performing maintenance on the soil vapor extraction system.

This HASP, which applies to persons present at the site actually or potentially exposed to hazardous materials, describes emergency response procedures for actual and potential chemical hazards. This HASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy by signing off on receipt of their individual copy of the document. Contractors and suppliers are retained as independent contractors and are responsible for ensuring the health and safety of their own employees.

1.0 INTRODUCTION AND SITE ENTRY REQUIREMENTS

This document describes the health and safety guidelines developed by Environmental Business Consultants (EBC) to ensure that workers are not exposed to risks from hazardous materials while performing chemical oxidant injections, sampling groundwater from the three monitoring wells installed within the sidewalk in front of the building and the one monitoring well installed on the Site, and performing maintenance on the soil vapor extraction system. In accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910.120 Hazardous Waste Operations and Emergency Response Final rule, this HASP, including the attachments, addresses safety and health hazards related to subsurface sample collection activities and is based on the best information available. The HASP may be revised by EBC at the request of the client and/or a regulatory agency upon receipt of new information regarding site conditions. Changes will be documented by written amendments signed by EBC's project manager, site safety officer and/or the EBC health and safety consultant.

1.1 Training Requirements

Personnel entering the exclusion zone or decontamination zone are required to be certified in health and safety practices for hazardous waste site operations as specified in the Federal OSHA Regulations CFR 1910.120e (revised 3/6/90).

Paragraph (e - 3) of the above referenced regulations requires that all on-site management personnel directly responsible for or who supervise employees engaged in hazardous waste operations, must initially receive 8 hours of supervisor training related to managing hazardous waste work.

Paragraph (e - 8) of the above referenced regulations requires that workers and supervisors receive 8 hours of refresher training annually on the items specified in Paragraph (e-1) and/or (e-3).

Additionally all on-site personnel must receive adequate site-specific training in the form of an on-site Health and Safety briefing prior to participating in field work with emphasis on the following:

- Protection of the adjacent community from hazardous vapors and / or dust which may be released during intrusive activities.
- Identification of chemicals known or suspected to be present on-site and the health effects and hazards of those substances.
- The need for vigilance in personnel protection, and the importance of attention to proper use, fit and care of personnel protective equipment.
- Decontamination procedures.
- Site control including work zones, access and security.
- Hazards and protection against heat or cold.
- The proper observance of daily health and safety practices, such as entry and exit of work zones and site. Proper hygiene during lunch, break, etc.
- Emergency procedures to be followed in case of fire, explosion and sudden release of hazardous gases.

Health and Safety meetings will be conducted on a daily basis and will cover protective clothing and other equipment to be used that day, potential and chemical and physical hazards, emergency procedures, and conditions and activities from the previous day.

1.2 Site Safety Plan Acceptance, Acknowledgment and Amendments

The project superintendent and the site safety officer are responsible for informing personnel (EBC employees and/or owner or owners representatives) entering the work area of the contents of this plan and ensuring that each person signs the safety plan acknowledging the on-site hazards and procedures required to minimize exposure to adverse effects of these hazards. A copy of the Acknowledgement Form is included in **Appendix A**.

Site conditions may warrant an amendment to the HASP. Amendments to the HASP are acknowledged by completing forms included in **Appendix B**.

1.3 Key Personnel - Roles and Responsibilities

Personnel responsible for implementing this Health and Safety Plan are:

Name	Title	Address	Contact Numbers
Mr. Kevin Brussee	EBC Project Manager	1808 Middle Country Road Ridge, NY 11961	(631) 504-6000 (631) 338-1749
Mr. Kevin Waters	Site Safety Officer	1808 Middle Country Road Ridge, NY 11961	(631) 504-6000 (516) 287-9023

The project manager is responsible for overall project administration and, with guidance from the site safety officer, for supervising the implementation of this HASP. The site safety officer will conduct daily (tail gate or tool box) safety meetings at the project site and oversee daily safety issues. Each subcontractor and supplier (defined as an OSHA employer) is also responsible for the health and safety of its employees. If there is any dispute about health and safety or project activities, on-site personnel will attempt to resolve the issue. If the issue cannot be resolved at the site, then the project manager will be consulted.

The site safety officer is also responsible for coordinating health and safety activities related to hazardous material exposure on-site. The site safety officer is responsible for the following:

1. Educating personnel about information in this HASP and other safety requirements to be observed during site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.
2. Coordinating site safety decisions with the project manager.
3. Designating exclusion, decontamination and support zones on a daily basis.
4. Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this HASP.
5. Maintaining the work zone entry/exit log and site entry/exit log.

6. Maintaining records of safety problems, corrective measures and documentation of chemical exposures or physical injuries (the site safety officer will document these conditions in a bound notebook and maintain a copy of the notebook on-site).

The person who observes safety concerns and potential hazards that have not been addressed in the daily safety meetings should immediately report their observations/concerns to the site safety officer or appropriate key personnel.

2.0 SITE BACKGROUND AND SCOPE OF WORK

Groundwater sampling previously performed at the Site identified VOCs and SVOCs at concentrations above GQS. Injections of a chemical oxidant are being performed to reduce the VOC concentrations, and groundwater sampling is being conducted at the Site in accordance with the requirements and frequency specified within the SMP to determine the effectiveness of the chemical oxidant injections. In addition, maintenance and/or repair of the soil vapor extraction system equipment may be performed.

Treatment of VOCs in groundwater and soil below the water table will be accomplished through the sequential injection of chemical oxidants followed by oxygen releasing compounds. The oxidant selected for this project is chelated iron activated sodium persulfate. Sodium persulfate is highly effective on ethyl-benzene, trimethylbenzene, p-ethyltoluene, p-diethylbenzene, xylene and other VOCs, providing rapid treatment of these compounds in a predictable manner. This method of treatment does not result in an exothermic reaction and will not enhance volatilization of VOCs in groundwater to the vapor phase. Sodium persulfate and a chelated iron activator will be delivered to the Site as a dry powder and mixed with water on-site to create a 15 to 20 percent solution. The activator will be added at a ratio of 9 lbs of FeEDTA powder to each 55 lb bag of sodium persulfate.

Periodic groundwater sampling will include the collection of five groundwater samples from the five monitoring wells. The location of each of the five groundwater monitoring wells is shown on **Figure 12** of the Remedial Action Work Plan. Each groundwater sample will be collected utilizing a peristaltic pump equipped with disposable pump head tubing and disposable polyethylene tubing.

3.0 SITE HAZARD EVALUATION

This section identifies the hazards associated with the proposed scope of work, general physical hazards that can be expected at most sites; and presents a summary of documented or potential chemical hazards at the site. Every effort must be made to reduce or eliminate these hazards. Those that cannot be eliminated must be guarded against using engineering controls and/or personal protective equipment.

This HASP has been developed for work performed at the site in association with a Phase II subsurface investigation. The primary hazards to the field crew will be physical hazards related to sample collection procedures and equipment, and chemical exposures to the sampling crew from exposure to potential contaminants which may be present at the site.

3.1 Physical Hazards

3.1.1 Tripping Hazards

An area of risk associated with on-site activities are presented by uneven ground, concrete, curbstones or equipment which may be present at the site thereby creating a potential tripping hazard. During intrusive work, care should be taken to mark or remove any obstacles within the exclusion zone.

3.1.2 Cuts and Lacerations

Field activities that involve drilling and boring equipment may result in cuts or lacerations from machinery and tools used in collecting samples, cutting disposable tubing and opening acetate sleeves and liners. A first aid kit approved by the American Red Cross will be available during all subsurface investigative activities.

3.1.3 Lifting Hazards

Improper lifting by workers is one of the leading causes of industrial injuries. Field workers and drillers may be required to lift heavy objects such as drilling tools, buckets of decontamination water, cement, etc. Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

3.1.4 Utility Hazards

Before conducting any subsurface boring or sampling, the drilling contractor will be responsible for locating and verifying all existing utilities at each excavation.

3.1.5 Traffic Hazards

All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state and federal agency regulations regarding such traffic and in accordance with NYCDOT guidelines. The drilling contractor shall carry on his operations without undue interference or delays to traffic. The drilling contractor shall furnish all labor, materials, guards, barricades, signs, lights, and anything else necessary to maintain traffic and to protect his work and the public, during operations.

3.2 Work in Extreme Temperatures

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress.

3.2.1 Heat Stress

The combination of high ambient temperature, high humidity, physical exertion, and personal protective apparel, which limits the dissipation of body heat and moisture, can cause heat stress.

The following prevention, recognition and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress and to apply the appropriate treatment.

1. Prevention
    a. Provide plenty of fluids. Available in the support zone will be a 50% solution of fruit punch and water or plain water.
    b. Work in Pairs. Individuals should avoid undertaking any activity alone.
    c. Provide cooling devices. A spray hose and a source of water will be provided to reduce body temperature, cool protective clothing and/or act as a quick-drench shower in case of an exposure incident.
    d. Adjustment of the work schedule. As is practical, the most labor-intensive tasks should be carried out during the coolest part of the day.

2. Recognition and Treatment
    a. Heat Rash (or prickly heat):
        Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.
        Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.
        Treatment: Remove source or irritation and cool skin with water or wet cloths.

    b. Heat Cramps (or heat prostration)
        Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.
        Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.

        Treatment: Perform the following while making arrangement for transport to a medical facility. Remove the worker to a contamination reduction zone. Remove protective clothing. Lie worker down on back in a cool place and raise feet 6 to 12 inches. Keep warm, but loosen all clothing. If conscious, provide sips of salt-water solution, using one teaspoon of salt in 12 ounces of water. Transport to a medical facility.

    c. Heat Stroke
        Cause: Same as heat exhaustion. This is also an extremely serious condition.

Symptoms: Dry and hot skin, dry mouth, dizziness, nausea, headache and rapid pulse.

Treatment: Cool worker immediately by immersing or spraying with cool water or sponge bare skin after removing protective clothing. Transport to hospital.

3.2.2 Cold Exposure

Exposure to cold weather, wet conditions and extreme wind-chill factors may result in excessive loss of body heat (hypothermia) and /or frostbite. To guard against cold exposure and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be readily available, rest periods should be adjusted as needed, and the physical conditions of on-site field personnel should be closely monitored. Personnel and supervisors working on-site will be made aware of the signs and symptoms of frost bite and hypothermia such as shivering, reduced blood pressure, reduced coordination, drowsiness, impaired judgment, fatigue, pupils dilated but reactive to light and numbing of the toes and fingers.

3.3 Chemical Hazards

3.3.1 Groundwater Sampling and Soil Exposure

There is documented contamination in groundwater consisting of VOCs and SVOCs.

The following compounds are considered for the Site as potential contaminants: volatile organic compounds (VOCs) related to an on-site release/spill of gasoline; and semi-volatile organic compounds (SVOCs) likely related to an off-site release/spills of petroleum fuel spills and/or background concentrations typically observed in Brooklyn.

The primary routes of exposure to these contaminants are from groundwater are ingestion and absorption. **Appendix C** includes information sheets for suspected chemicals that may be encountered at the site.

Respirable Dust and Direct Contact with Soil and Groundwater

Dust may be generated from drilling activities. If visible observation detects elevated levels of dust, a program of wetting will be employed by the site safety officer. If elevated dust levels persist, the site safety office will employ dust monitoring using a particulate monitor (Miniram or equivalent). If monitoring detects concentrations greater than the OSHA action level of 5,000 $\mu g/m^3$ over daily background, the site safety officer will take corrective actions as defined herein, including the use of water for dust suppression and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges.

Absorption pathways for dust and direct contact with soil and groundwater will be mitigated with the implementation of latex gloves, hand washing and decontamination exercises when necessary.

Organic Vapors

Considering the past and present use of the properties, VOCs may be encountered at the site in groundwater. Therefore, the release of organic vapors to the atmosphere may occur during groundwater sampling. The site safety officer will periodically monitor organic vapors with a Photoionization Detector (PID) during groundwater sampling to determine whether organic

vapor concentrations exceed action levels shown below.

PID Response	Action
Sustained readings of 5 ppm or greater	Shut down equipment and allow area to vent. Resume when readings return to background
Sustained readings of 5 ppm or greater that do not subside after venting	Implement Vapor Release Plan (Section 6.8). Re-evaluate respiratory protection as upgrade may be required.

3.3.2 Chemical Oxidant Injection and Exposure

Chemical oxidant injections are to consist of Klozur® SP mixed with water on-site to create a 15 to 20 percent solution. The mixing ration is to consist of 9 lbs of Dissolvine® E-FE-13 powder to each 55 lb bag of Klozur® SP.

Klozur® SP, also known as Sodium Peroxydisulfate, is recommeneded for in-situ and ex-situ chemical oxidation of contaminants and compounds of concern for environmental remediation applications. Sodium Peroxydisulfate is comprised of white, odorless crystals (powder), that is an oxidizer, and contact with combustible material may cause fire.

Sodium Peroxydisulfate causes eye irritation, may cause sensitization by skin contact, may cause irritation of the respiratory tract if inhaled, and would be harmful if swallowed. Avoid contact with skin and eyes, and avoid breathing dust. Personal protective equipment during handling of Sodium Peroxydisulfate should include arm length rubber gloves and goggles.

Contact with Dissolvine® E-FE-13 may cause a slight skin irritation, inhalation of dust in high concentration may cause irritation of the respiratory system and contact with dust in eyes may cause mechanical eye irritation.

A copy of the MSDS for Sodium Peroxydisulfate and Dissolvine® E-FE-13 is included in Appendix C.

4.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) shall be selected in accordance with OSHA 29 CFR 1910.120(c), (g), and 1910.132. Protective equipment shall be NIOSH approved and respiratory protection shall conform to OSHA 29 CFR Part 1910.133 and 1910.134 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133; and foot protection shall conform to 1910.136. The only true difference among the levels of protection from D thru B is the addition of the type of respiratory protection. **It is anticipated that work will be performed in Level D PPE.**

4.1 Level D

Level D PPE shall be donned when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or the potential for inhalation of, or contact with, hazardous concentrations of harmful chemicals. Level D PPE consists of:

- standard work uniform, coveralls, or tyvek, as needed;
- steel toe and steel shank work boots;
- high visibility safety vest;
- hard hat;
- gloves, as needed;
- safety glasses;
- hearing protection;
- equipment replacements are available as needed.

4.2 Level C

Level C PPE shall be donned when the concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), but are less than 5 ppm. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

- chemical resistant or coated tyvek coveralls;
- steel-toe and steel-shank workboots;
- high visibility safety vest;
- chemical resistant overboots or disposable boot covers;
- disposable inner gloves (surgical gloves);
- disposable outer gloves;
- full face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified or expected contaminants;
- hard hat;
- splash shield, as needed; and,
- ankles/wrists taped with duct tape.

The site safety officer will verify if Level C is appropriate by checking organic vapor concentrations using compound and/or class-specific detector tubes.

The exact PPE ensemble is decided on a site-by-site basis by the Site Safety Officer with the intent to provide the most protective and efficient worker PPE.

4.3 Activity-Specific Levels of Personal Protection

The required level of PPE is activity-specific and is based properties of identified or expected contaminants. **It is expected that groundwater sampling and chemical oxidant injections will be performed in Level D.** If air monitoring results indicate the necessity to upgrade (sustained VOCs above 5 ppm in the breathing zone) the level of protection engineering controls (i.e. Facing equipment away from the wind and placing site personnel upwind of excavations, active venting, etc.) will be implemented before requiring the use of respiratory protection.

5.0 SITE CONTROL

5.1 Work Zones

The primary purpose of site controls is to establish the perimeter of a hazardous area, to reduce the migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. When operations are to take place involving hazardous materials, the site safety officer will establish an exclusion zone, a decontamination zone, and a support zone. These zones "float" (move around the site) depending on the tasks being performed on any given day. The site safety officer will outline these locations before work begins and when zones change. The site safety officer records this information in the site log book. **It is expected that for groundwater sampling activities, identification of an exclusion zone, decontamination zone, and support zone will not be necessary.**

Tasks requiring OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training are carried out in the exclusion zone. The exclusion zone is defined by the site safety officer but will typically be a 50-foot area around work activities. Gross decontamination (as determined by the site Health and Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer.

Protective equipment is removed in the decontamination zone. Disposable protective equipment is stored in receptacles staged in the decontamination zone, and non-disposable equipment is decontaminated. All personnel and equipment exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

The support zone is used for vehicle parking, daily safety meetings, and supply storage. Eating, drinking, and smoking are permitted only in the support zone. When a decontamination trailer is not provided, the eye wash unit, first aid equipment, and drinking water are kept at a central location designated by the site safety officer.

6.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

Site personnel must be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather.

Emergency telephone numbers and a map to the hospital will be posted in the command post. Site personnel should be familiar with the emergency procedures, and the locations of site safety, first aid, and communication equipment.

6.1 Emergency Equipment On-site

Private telephones:	Site personnel.
Two-way radios:	Site personnel where necessary.
Emergency Alarms:	On-site vehicle horns*.
First aid kits:	On-site, in vehicles or office.
Fire extinguisher:	On-site, in office or on equipment.

* Horns: Air horns will be supplied to personnel at the discretion of the project superintendent or site safety officer.

6.2 Emergency Telephone Numbers

General Emergencies	911
New York City Police	911
Woodhull Medical Center	1-718-963-8000
NYSDEC Spills Division	1-800-457-7362
NYSDEC Division of Env. Remediation	1-718-482-4900
NYCDEP	1-718-699-9811
NYC Department of Health	1-212-788-4711
NYC Fire Department	911
National Response Center	1-800-424-8802
Poison Control	1-212-340-4494
Site Safety Officer	1-631-504-6000
Alternate Site Safety Officer	1-631-504-6000

6.3 Personnel Responsibilities During an Emergency

The project manager is primarily responsible for responding to and correcting any emergency situations. However, in the absence of the project manager, the site safety officer shall act as the project manager's on-site designee and perform the following tasks:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, evacuate and secure the site, or upgrade/downgrade the level of protective clothing and respiratory protection;

- Ensure that appropriate federal, state, and local agencies are informed and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. If toxic materials are released to the air, the local authorities should be informed in order to assess the need for evacuation;

- Ensure appropriate decontamination, treatment, or testing for exposed or injured personnel;

- Determine the cause of incidents and make recommendations to prevent recurrence; and,

- Ensure that all required reports have been prepared.

The following key personnel are planned for this project:

- Project Manager Mr. Kevin Brussee (631) 504-6000
- Site Safety Officer Mr. Kevin Waters (631) 504-6000
- Alternate Mr. Charles Sosik (631) 504-6000

6.4 Medical Emergencies

A person who becomes ill or injured in the exclusion zone will be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination will be completed and first aid administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (**Appendix D**) must be filled out for any injury.

A person transporting an injured/exposed person to a clinic or hospital for treatment will take the directions to the hospital (**Appendix D**) and information on the chemical(s) to which they may have been exposed (**Appendix C**).

6.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be summoned immediately. The site safety officer or his designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials on-site. If it is safe to do so, site personnel may:

- use fire fighting equipment available on site; or,
- remove or isolate flammable or other hazardous materials that may contribute to the fire.

6.6 Evacuation Routes

Evacuation routes established by work area locations for each site will be reviewed prior to commencing site operations. As the work areas change, the evacuation routes will be altered accordingly, and the new route will be reviewed.

Under extreme emergency conditions, evacuation is to be immediate without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. When evacuating the site, personnel will follow these instructions:

- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation through the decontamination corridor is not possible, personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.
- The site safety officer will conduct a head count to ensure that all personnel have been evacuated safely. The head count will be correlated to the site and/or exclusion zone entry/exit log.
- If emergency site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

6.7 Spill Control Procedures

Spills associated with site activities may be attributed to project equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure equipment soundness. In the event of a spill, site personnel will immediately notify the NYSDEC (1-800-457-7362), and a spill number will be generated.

6.8 Vapor Release Plan

If work zone organic vapor (excluding methane) exceeds 5 ppm, then a downwind reading will be made either 200 feet from the work zone or at the property line, whichever is closer. If readings at this location exceed 5 ppm over background, the work will be stopped.

If 5 ppm of VOCs are recorded over background on a PID at the property line, then an off-site reading will be taken within 20 feet of the nearest residential or commercial property, whichever is closer. If efforts to mitigate the emission source are unsuccessful for 30 minutes, then the designated site safety officer will:

- contact the local police;
- continue to monitor air every 30 minutes, 20 feet from the closest off-site property. If two successive readings are below 5 ppm (non-methane), off-site air monitoring will be halted.
- All property line and off site air monitoring locations and results associated with vapor releases will be recorded in the site safety log book.

APPENDIX A

SITE SAFETY ACKNOWLEDGEMENT FORM

DAILY BREIFING SIGN-IN SHEET

Date:_____ Person Conducting Briefing:_____

Project Name and Location:_____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc…):

_____

_____

_____

_____

2. OTHER ISSUES (HASP changes, attendee comments, etc…):

_____

_____

_____

3. ATTENDEES (Print Name):

1.	11.
2.	12.
3.	13.
4.	14.
5.	15.
6.	16.
7.	17.
8.	18.
9.	19.
10.	20.

APPENDIX B

SITE SAFETY PLAN AMENDMENTS

SITE SAFETY PLAN AMENDMENT FORM

Site Safety Plan Amendment #: _____

Site Name: _____

Reason for Amendment: _____

_____

_____

_____

Alternative Procedures: _____

_____

_____

_____

Required Changes in PPE: _____

_____

_____

_____

_____ _____

Project Superintendent (signature) **Date**

_____ _____

Health and Safety Consultant (signature) **Date**

_____ _____

Site Safety Officer (signature) **Date**

APPENDIX C

CHEMICAL HAZARDS

CHEMICAL HAZARDS

The attached International Chemical Safety Cards are provided for contaminants of concern that have been identified in soils and/or groundwater at the site.

Material Safety Data Sheet

Klozur® SP

MSDS #: 7775-27-1-12
Revision Date: 2014-04-15
Version 3

This MSDS has been prepared to meet U.S. OSHA Hazard Communication Standard 29 CFR 1910.1200 And Canadian Workplace Hazardous Materials Information System (WHMIS) requirements.

1. PRODUCT AND COMPANY IDENTIFICATION

Product name **Klozur® SP**

Synonyms Sodium Peroxydisulfate; Disodium Peroxydisulfate; Peroxydisulfuric acid, disodium salt; Peroxydisulfuric acid, sodium salt

Formula Na2O8S2 and $Na_2S_2O_8$

Recommended use: In situ and ex situ chemical oxidation of contaminants and compounds of concern for environmental remediation applications

Restrictions on use: No uses to be advised against were identified

Manufacturer

PeroxyChem LLC
1735 Market Street
Philadelphia, PA 19103
Phone: +1 215/ 299-5858 (General Information)
E-Mail: sdsinfo@peroxychem.com

Emergency telephone number

For leak, fire, spill or accident emergencies, call:
1 800 / 424 9300 (CHEMTREC - U.S.A.)
1 703 / 527 3887 (CHEMTREC - Collect - All Other Countries)
1 303/ 389-1409 (Medical - U.S. - Call Collect)

2. HAZARDS IDENTIFICATION

Emergency Overview

White, odorless crystals
Oxidizer; Contact with combustible material may cause fire.
Decomposes in storage under conditions of moisture and/or excessive heat causing release of sulfur oxides and oxygen that supports combustion (See Section 10).

Potential health effects

Acute Toxicity

Eyes Causes moderate eye irritation.
Skin Moderately irritating to the eyes. May cause sensitization by skin contact.
Inhalation May cause irritation of respiratory tract. Respiratory sensitizer.
Ingestion Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Name	CAS-No	Weight %
Sodium Persulfate	7775-27-1	> 99

4. FIRST AID MEASURES

General advice Remove from exposure, lie down. Show this material safety data sheet to the doctor in attendance.

Eye contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids intermittently. Consult a physician. In case of contact, immediately flush eyes with plenty of water. If symptoms persist, call a physician.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation develops and persists.

Inhalation Remove from exposure, lie down. If breathing is irregular or stopped, administer artificial respiration. Call a physician immediately.

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately. Rinse mouth. Drink 1 or 2 glasses of water.

5. FIRE-FIGHTING MEASURES

Flash Point Not flammable

Suitable extinguishing media Water. Cool containers with flooding quantities of water until well after fire is out.

Unsuitable Extinguishing Media Do not use carbon dioxide or other gas filled fire extinguishers; they will have little effect on decomposing persulfate.

Explosion Data
Sensitivity to Mechanical Impact Not applicable
Sensitivity to Static Discharge Not applicable

Specific hazards arising from the chemical Decomposes under fire conditions to release oxygen that intensifies the fire.

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 Hazard 2	Flammability 0	Stability 1	Special Hazards OX

6. ACCIDENTAL RELEASE MEASURES

Personal precautions Keep off any unprotected persons. Avoid contact with the skin and the eyes. Avoid breathing dust. Wear personal protective equipment.

Methods for containment Vacuum, shovel or pump waste into a drum and label contents for disposal. Avoid dust formation Store in closed container

Methods for cleaning up Clean up spill area and treat as special waste. Clean up the area with plenty of water.

Other Never add other substances or combustible waste to product residues.

7. HANDLING AND STORAGE

Handling

Wear personal protective equipment. Refer to Section 8. Use only in area provided with appropriate exhaust ventilation. Avoid dust formation. Handle product only in closed system or provide appropriate exhaust ventilation at machinery. Avoid contact with skin and eyes. Avoid breathing dust. Remove and wash contaminated clothing before re-use.

Storage

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat. Do not store near combustible materials. Avoid contamination of opened product. Keep away from food, drink and animal feedingstuffs. Avoid formation and deposition of dust.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

Exposure guidelines .

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH	Mexico
Sodium Persulfate 7775-27-1	TWA: 0.1 mg/m³			

Chemical Name	British Columbia	Quebec	Ontario TWAEV	Alberta
Sodium Persulfate 7775-27-1	TWA: 0.1 mg/m³		TWA: 0.1 mg/m³	TWA: 0.1 mg/m³

Occupational exposure controls

Engineering measures

Local exhaust ventilation w >90% efficiency.

Respiratory protection

If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Eye/face protection

Eye protection recommended. Chemical goggles consistent with EN 166 or equivalent.

Skin and body protection

Wear suitable protective clothing. Protective shoes or boots.

Hand protection

Protective gloves: Neoprene gloves, Polyvinylchloride, Natural Rubber.

Hygiene measures

Keep away from food, drink and animal feeding stuffs. Do not eat, drink or smoke when using this product. Wash hands before breaks and after shifts. Keep work clothes separate, remove contaminated clothing - launder after open handling of product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Crystalline solid
Color	white
Physical state	solid
Odor	Odorless
Odor Threshold	Not applicable
pH	6.0 (1% solution)
Melting Point/Range	Decomposes on heating. 180 °C
Freezing point	Not applicable
Boiling Point/Range	Decomposes
Flash Point	Not flammable
Evaporation rate	Not applicable
Oxidizing properties	Oxidizer
Explosive properties	Not explosive
Vapor pressure	6.07E-30 mm Hg at 25ºC
Vapor density	No information available

Specific Gravity	1.68
Molecular Weight	238.1
Water solubility	730 g/L @ 25 °C
Percent volatile	No information available
Partition coefficient	Not applicable
Viscosity	(Solid)
Decomposition Temperature	> 100 °C
Autoignition Temperature	No evidence of combustion up to 600°C

10. STABILITY AND REACTIVITY

Stability Stable.

Conditions to avoid Heat; Moisture; Combustibles such as paper and wood.

Materials to avoid Acids, Bases, Halides, Oxidizing agents, Strong reducing agents, Combustible materials,

Hazardous decomposition products None known .

Hazardous polymerization Hazardous polymerization does not occur.

Hazardous reactions Use of persulfates in chemical reactions requires appropriate precautions and design considerations for pressure and thermal relief.

Decomposing persulfates will evolve large volumes of gas and/or vapor, can accelerate exponentially with heat generation, and create significant and hazardous pressures if contained and not properly controlled or mitigated.

Use with alcohols in the presence of water has been demonstrated to generate conditions that require rigorous adherence to process safety methods and standards to prevent escalation to an uncontrolled reaction.

11. TOXICOLOGICAL INFORMATION

Acute effects

Eye irritation Irritating to eyes. Has been shown to exhibit eye irritation properties in human case reports following occupational exposure and consumer use. Slight irritation (rabbit).

Skin irritation Irritating to skin. Persulfates in general, specifically diammonium persulfate and dipotassium persulfate, exhibited skin irritation properties in human case reports, following occupational exposure and consumer use. Slight irritation (rabbit).

LD50 Oral	1200 mg/kg (Rat) Sodium Persulfate
LD50 Dermal	> 10,000 mg/kg (rabbit) Sodium Persulfate
LC50 Inhalation	= > 5.1 mg/L (4-hr) (Rat) Sodium Persulfate

Sensitization Sensitizing to skin and respiratory system Positive in a local lymph node assay.

Chronic Toxicity

Carcinogenicity Did not show carcinogenic effects in animal experiments

Mutagenicity In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects.

Target Organ Effects Eyes, Skin, Respiratory system.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Sodium Persulfate (7775-27-1)

Active Ingredient(s)	Duration	Species	Value	Units
Sodium Persulfate	96 h LC50	Rainbow trout	163	mg/L
Sodium Persulfate	48 h LC50	Daphnia magna	133	mg/L
Sodium Persulfate	96 h LC50	Grass shrimp	519	mg/L
Sodium Persulfate	72 h EC50	Algae S. capricornutum	116	mg/L

Persistence and degradability Biodegradability does not pertain to inorganic substances.

Bioaccumulation Does not bioaccumulate.

Mobility Dissociates into ions.

Other adverse effects None known

13. DISPOSAL CONSIDERATIONS

Waste disposal methods This material, as supplied, is a hazardous waste according to federal regulations (40 CFR 261). It must undergo special treatment, e.g. at suitable disposal site, to comply with local regulations.

RCRA D Waste Code D001 (ignitable).

Contaminated packaging Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

DOT

UN/ID No UN 1505
Proper shipping name SODIUM PERSULFATE
Hazard Class 5.1
Packing group III
Reportable Quantity (RQ) not applicable

TDG

UN/ID No UN 1505
Proper shipping name SODIUM PERSULFATE
Hazard Class 5.1
Packing group III

ICAO/IATA

UN/ID No UN 1505
Proper shipping name SODIUM PERSULFATE
Hazard Class 5.1
Packing group III

IMDG/IMO

UN/ID No UN 1505
Proper shipping name SODIUM PERSULFATE
Hazard Class 5.1
Packing group III

ADR/RID

UN/ID No 1505
Proper shipping name SODIUM PERSULFATE

Hazard Class	5.1
Packing group	III
Description	Oxidizer

15. REGULATORY INFORMATION

International Inventories

TSCA Inventory (United States of America)	Complies
DSL (Canada)	Complies
NDSL (Canada)	Complies
EINECS/ELINCS (Europe)	Complies
ENCS (Japan)	Complies
IECSC (China)	Complies
KECL (Korea)	Complies
PICCS (Philippines)	Complies
AICS (Australia)	Complies
NZIoC (New Zealand)	Complies

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Acute Health Hazard	yes
Chronic Health Hazard	no
Fire Hazard	yes
Sudden Release of Pressure Hazard	no
Reactive Hazard	no

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

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

C Oxidizing materials
D2A Very toxic materials
D2B Toxic materials

16. OTHER INFORMATION

HMIS	Health Hazard 2	Flammability 0	Stability 1	Special precautions J

Protection=J (Safety goggles, gloves, apron, combination dust and vapor respirator)

Product Certifications

Revision Date: 2014-04-15
Reason for revision: Initial Release.

Disclaimer
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Prepared By

PeroxyChem

End of Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET

Dissolvine® E-FE-13

MSDS #: 15708-41-5
Revision date: 2014-06-25
Version 2

This MSDS has been prepared to meet U.S. OSHA Hazard Communication Standard 29 CFR 1910.1200 And Canadian Workplace Hazardous Materials Information System (WHMIS) requirements.

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name **Dissolvine® E-FE-13**

Synonyms Ferric sodium EDTA; CHEMICAL NAME: Ethyldiaminetetraacetic acid, ferric sodium complex
Formula $C_{10}H_{12}FeN_2O_8Na.3H_2O$

Recommended Use: Chelating agent; Plant nutrient

Manufacturer/Supplier

PeroxyChem LLC
1735 Market Street
Philadelphia, PA 19103
Phone: +1 215/ 299-5858 (General Information)
E-Mail: sdsinfo@peroxychem.com

Emergency telephone number

For leak, fire, spill or accident emergencies, call:
1 800 / 424 9300 (CHEMTREC - U.S.A.)
1 703 / 527 3887 (CHEMTREC - Collect - All Other Countries)
1 303/ 389-1409 (Medical - U.S. - Call Collect)

Medical / Handling Emergencies:
1 914 / 693-6946 (Akzo Nobel - U.S.A.)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Yellow-green odorless powder
Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source, is a potential dust explosion hazard.

Potential Health Effects

Eyes Product dust may cause mechanical eye irritation.
Skin Substance may cause slight skin irritation.
Inhalation Inhalation of dust in high concentration may cause irritation of respiratory system.
Ingestion No known effect based on information supplied.

Chronic toxicity In a 31/61-day oral study on rats with Ferric-sodium EDTA, the NOAEL >/= 84 mg/kg.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical name	CAS-No	Weight %
EDTA ferric sodium complex	15708-41-5	87-89
Water	7732-18-5	11-13

4. FIRST AID MEASURES

Eye Contact In case of eye contact, remove contact lenses and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention if irritation persists.

Skin Contact Wash off with warm water and soap. Wash contaminated clothing before reuse. Get medical attention if irritation develops and persists.

Inhalation Move to fresh air. If breathing difficulty or discomfort occurs and persists, obtain medical attention.

Ingestion Rinse mouth with water and afterwards drink plenty of water or milk. Do not induce vomiting or give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

5. FIRE-FIGHTING MEASURES

Flammable properties Not combustible.

Suitable Extinguishing Media Use CO_2, dry chemical, or foam. Soft stream or water fog only if necessary.

Explosion data
Sensitivity to Mechanical Impact Not sensitive
Sensitivity to Static Discharge Not sensitive

Specific Hazards Arising from the Chemical Avoid dust formation. Fine dust dispersed in air, in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Protective equipment and precautions for firefighters As in any fire, wear self-contained breathing apparatus and full protective gear.

NFPA	Health Hazards 1	Flammability 1	Stability 0	Special Hazards -

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Avoid contact with the skin and the eyes. Powder becomes slippery when wet. For personal protection see section 8.

Methods for Containment Cover with plastic sheet to prevent spreading Do not allow material to enter storm or sanitary sewer system Use a wet sweeping compound or water to prevent dust formation Sweep or vacuum up spillage and return to container Material may be recycled when contamination is not a problem

Methods for cleaning up After cleaning, flush away traces with water. Dispose of waste as indicated in Section 13.

7. HANDLING AND STORAGE

Handling Avoid dust formation. Use in well ventilated areas to prevent formation of explosive dust-air mixtures. Avoid inhalation and prolonged and/or repeated skin and eye contact.

Storage Keep tightly closed in a dry and cool place. Containers should not be opened until ready to use. Store in original container. Keep at temperatures below 25°C. Keep away from incompatible materials (see Section 10).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines .

Chemical name	British Columbia	Quebec	Ontario TWAEV	Alberta
EDTA ferric sodium complex 15708-41-5	TWA: 1 mg/m³	TWA: 1.0 mg/m³	TWA: 1 mg/m³	TWA: 1 mg/m³

Occupational exposure controls

Engineering measures Apply technical measures to comply with the occupational exposure limits. When working in confined spaces (tanks, containers, etc.), ensure that there is a supply of air suitable for breathing and wear the recommended equipment.

Respiratory Protection Whenever dust in the worker's breathing zone cannot be controlled with ventilation or other engineering means, workers should wear respirators or dust masks approved by NIOSH/MSHA, EU CEN or comparable organization to protect against airborne dust.

Eye/Face Protection Tightly fitting safety goggles

Skin and Body Protection Protective shoes or boots Wear suitable protective clothing

Hand Protection Protective gloves: Nitrile rubber.

Hygiene measures When using, do not eat, drink or smoke. Wash hands and face before breaks and immediately after handling the product

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Yellow to green Powder
Physical State	Solid
Odor	odorless
pH	(1% solution) 4 - 5.5
Melting Point/Range	80 °C (crystal water loss)
Boiling Point/Range	Not applicable
Flash point	Not applicable
Flammable properties	Not combustible
Density	0.95 g/cm³
Water solubility	90 g/L @ 20 °C; 300 g/L @ 80 °C
Partition coefficient	log Pow = <1
Decomposition temperature	No information available
Autoignition temperature	> 200 °C

10. STABILITY AND REACTIVITY

Stability Stable under recommended storage conditions.

Conditions to Avoid	Temperatures above 25°C. Very hygroscopic; protect from moisture.
Hazardous Decomposition Products	Thermal decomposition can lead to release of irritating and toxic gases and vapors: Nitrogen oxides (NOx), Carbon oxides (COx), Metal oxides.
Hazardous polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Effects

Eye irritation	Non-irritating.
Skin irritation	Non-irritating to the skin
LD50 Oral	> 2000 mg/kg bw (rat)
LD50 Dermal	> 2000 mg/kg bw (rat)
LC50 Inhalation	> 2.75 mg/L (4-hr)
Sensitization	Did not cause sensitization on laboratory animals

Chronic toxicity

Chronic toxicity	In a 31/61-day oral study on rats with Ferric-sodium EDTA, the NOAEL >/= 84 mg/kg.
Carcinogenicity	Not recognized as carcinogenic by Research Agencies (IARC, NTP, OSHA, ACGIH)
Mutagenicity	Not mutagenic in AMES Test. Ferric sodium EDTA gave a positive response in the Mouse Lynphoma Assay (in vitro) with and without metabolic activation at concentrations that were cytotoxic. The positive response was attributed to a possible sensitivity of the cells to abnormal iron concentrations.
Reproductive toxicity	EDTA and its sodium salts have been reported, in some studies, to cause birth defects in laboratory animals only at exaggerated doses that were toxic to the mother. These effects are likely associated with zinc deficiency due to chelation. Exposures having no effect on the mother should have no effect on the fetus. Based on data with a related substance (magnesium-disodium EDTA), the NOAEL is expected to be 500 mg/kg.
Target organ effects	Skin, Eyes.

12. ECOLOGICAL INFORMATION

Ecotoxicity

EDTA ferric sodium complex (15708-41-5)

Active Ingredient(s)	Duration	Species	Value	Units
Ferric Sodium EDTA	96 h LC50	Rainbow trout	>100	mg/L
Ferric Sodium EDTA	35 d NOEC	Zebra fish	28.9	mg/L
Ferric Sodium EDTA	48 h EC50	Daphnia magna	100.9	mg/L
Ferric Sodium EDTA	21 d NOEC	Daphnia magna	31	mg/L
Ferric Sodium EDTA	72 h NOEC	Algae	69.9	mg/L

Persistence and degradability Inherently biodegradable. EDTA ferric-sodium complex is photodegradable with a half life of 20 days.

Bioaccumulation Bioaccumulation is unlikely.

Mobility Will likely be mobile in the environment due to its water solubility. C.O.D. is approximately 570 mg/g.

13. DISPOSAL CONSIDERATIONS

Waste 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 Cleaning the container before final disposal is the responsibility of the person disposing of the container. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

DOT NOT REGULATED

TDG NOT REGULATED

ICAO/IATA NOT REGULATED

IMDG/IMO NOT REGULATED

15. REGULATORY INFORMATION

International Inventories

TSCA (United States)	Complies
DSL (Canada)	Complies
NDSL (Canada)	Complies
EINECS/ELINCS (Europe)	Complies
ENCS (Japan)	-
China (IECSC)	Complies
KECL (Korea)	Complies
PICCS (Philippines)	Complies

AICS (Australia)	Complies
NZIoC (New Zealand)	Complies

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic health hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

International Regulations

Mexico - Grade Slight risk, Grade 1

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

Non-controlled

16. OTHER INFORMATION

HMIS	Health Hazards 1	Flammability 1	Stability 0	Special precautions -

Revision date:	2014-06-25
Reason for revision:	Initial Release.

Disclaimer

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Prepared By:

PeroxyChem

End of Safety Data Sheet

International Chemical Safety Cards

1,2,4-TRIMETHYLBENZENE

ICSC: 1433

Pseudocumene

C_9H_{12}

Molecular mass: 120,2

ICSC # 1433
CAS # 95-63-6
RTECS # DC3325000
UN # 1993
EC # 601-043-00-3
March 06, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Alcohol-resistant foam, dry powder, carbon dioxide.
EXPLOSION	Above 44°C explosive vapour/air mixtures may be formed.	Above 44°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness. Dry skin.	Protective gloves.	Rinse skin with plenty of water or shower.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	(See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	Xn symbol N symbol R: 10-20-36/37/38-51/53 S: 2-26-61 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1433

International Chemical Safety Cards

1,2,4-TRIMETHYLBENZENE

ICSC: 1433

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on burning producing toxic and irritating fumes Reacts violently with strong oxidants causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: (as mixed isomers) 25 ppm as TWA (ACGIH 2004). MAK: (as mixed isomers) 20 ppm 100 mg/m³ Peak limitation category: II(2) Pregnancy risk group: C (DFG 2004). OSHA PEL†: none NIOSH REL: TWA 25 ppm (125 mg/m^3) NIOSH IDLH: N.D. See: IDLH INDEX	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. Lungs may be affected by repeated or prolonged exposure , resulting in chronic bronchitis The substance may have effects on the central nervous system blood See Notes.
PHYSICAL PROPERTIES	Boiling point: 169°C Melting point: -44°C Relative density (water = 1): 0.88 Solubility in water: very poor Relative vapour density (air = 1): 4.1	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01 Flash point: 44°C c.c. Auto-ignition temperature: 500°C Explosive limits, vol% in air: 0.9-6.4 Octanol/water partition coefficient as log Pow: 3.8
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. 	

N O T E S

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is suggested. See also ICSC 1155 1,3,5-Trimethylbenzene (Mesitylene), ICSC 1362 1,2,3-Trimethylbenzene (Hemimellitene), ICSC 1389 Trimethyl benzene (mixed isomers). 1,3,5-Trimethylbenzene (Mesitylene) is classified as a marine pollutant.

Transport Emergency Card: TEC (R)-30GF1-III
NFPA Code: H0; F2; R0;

ADDITIONAL INFORMATION

International Chemical Safety Cards

1,3,5-TRIMETHYLBENZENE

ICSC: 1155

Mesitylene
C_9H_{12}
Molecular mass: 120.2

ICSC # 1155
CAS # 108-67-8
RTECS # OX6825000
UN # 2325
EC # 601-025-00-5
March 06, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Alcohol-resistant foam, dry powder, carbon dioxide.
EXPLOSION	Above 50°C explosive vapour/air mixtures may be formed.	Above 50°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•**INHALATION**	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•**EYES**	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	(See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.	Marine pollutant. Xi symbol N symbol R: 10-37-51/53 S: 2-61 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

1,3,5-TRIMETHYLBENZENE

ICSC: 1155

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes on burning producing toxic and irritating fumes. Reacts violently with strong oxidants causing fire and explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS:** TLV (as mixed isomers): 25 ppm; (ACGIH 2001). MAK (all isomers): 20 ppm; 100 mg/m^3; class II 1 © (2001) OSHA PEL†: none NIOSH REL: TWA 25 ppm (125 mg/m^3) NIOSH IDLH: N.D. See: IDLH INDEX **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. Lungs may be affected by repeated or prolonged exposure, resulting in chronic bronchitis. The substance may have effects on the central nervous system blood See Notes.
PHYSICAL PROPERTIES	Boiling point: 165°C Melting point: -45°C Relative density (water = 1): 0.86 Solubility in water: very poor Vapour pressure, kPa at 20°C: 0.25 Relative vapour density (air = 1): 4.1 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01 Flash point: 50°C (c.c.) Auto-ignition temperature: 550°C Octanol/water partition coefficient as log Pow: 3.42
ENVIRONMENTAL DATA	The substance is harmful to aquatic organisms. Bioaccumulation of this chemical may occur in fish. 

NOTES

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. See ICSC 1433 1,2,4-Trimethylbenzene (Pseudocumene), ICSC 1362 1,2,3-Trimethylbenzene (Hemimellitene), ICSC 1389 Trimethyl benzene (mixed isomers).

Transport Emergency Card: TEC (R)-30S2325
NFPA Code: H0; F2; R0

ADDITIONAL INFORMATION

International Chemical Safety Cards

BENZENE

ICSC: 0015

Cyclohexatriene
Benzol
C_6H_6
Molecular mass: 78.1

ICSC # 0015
CAS # 71-43-2
RTECS # CY1400000
UN # 1114
EC # 601-020-00-8
May 06, 2003 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive. Risk of fire and explosion: see Chemical Dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	
•**INHALATION**	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	MAY BE ABSORBED! Dry skin. Redness. Pain. (Further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•**EYES**	Redness. Pain.	Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Abdominal pain. Sore throat. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Fireproof. Separated from food and feedstuffs oxidants halogens	Do not transport with food and feedstuffs. Note: E F symbol T symbol R: 45-46-11-36/38-48/23/24/25-65 S: 53-45 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

International Chemical Safety Cards

BENZENE

ICSC: 0015

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with oxidants, nitric acid, sulfuric acid and halogens causing fire and explosion hazard. Attacks plastic and rubber.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.5 ppm as TWA 2.5 ppm as STEL (skin) A1 BEI (ACGIH 2004).
MAK: H
Carcinogen category: 1 Germ cell mutagen group: 3A (DFG 2004).
OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F
NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A
NIOSH IDLH: Ca 500 ppm See: 71432

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation through the skin and by ingestion

INHALATION RISK:
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system , resulting in lowering of consciousness Exposure far above the occupational exposure limit value may result in unconsciousness death

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the bone marrow immune system , resulting in a decrease of blood cells. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 80°C
Melting point: 6°C
Relative density (water = 1): 0.88
Solubility in water, g/100 ml at 25°C: 0.18
Vapour pressure, kPa at 20°C: 10
Relative vapour density (air = 1): 2.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point:
-11°C c.c.
Auto-ignition temperature: 498°C
Explosive limits, vol% in air: 1.2-8.0
Octanol/water partition coefficient as log Pow: 2.13

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms.

NOTES

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-30S1114 / 30GF1-II
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0015 **BENZENE**

IMPORTANT LEGAL NOTICE:

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

Ethylbenzol
Phenylethane
EB
C_8H_{10} / $C_6H_5C_2H_5$
Molecular mass: 106.2

ICSC # 0268
CAS # 100-41-4
RTECS # DA0700000
UN # 1175
EC # 601-023-00-4
March 13, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•**INHALATION**	Cough. Dizziness. Drowsiness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•**EYES**	Redness. Pain. Blurred vision.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	(Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: A filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-20 S: 2-16-24/25-29 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0268

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH AROMATIC ODOUR. **PHYSICAL DANGERS:** The vapour mixes well with air, explosive mixtures are easily formed. **CHEMICAL DANGERS:** Reacts with strong oxidants. Attacks plastic and rubber. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA 125 ppm as STEL A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued (ACGIH 2005). MAK: skin absorption (H); Carcinogen category: 3A; (DFG 2004). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3) NIOSH IDLH: 800 ppm 10%LEL See: 100414	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system Exposure far above the OEL could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis.
PHYSICAL PROPERTIES	Boiling point: 136°C Melting point: -95°C Relative density (water = 1): 0.9 Solubility in water, g/100 ml at 20°C: 0.015 Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 18°C c.c. Auto-ignition temperature: 432°C Explosive limits, vol% in air: 1.0-6.7 Octanol/water partition coefficient as log Pow: 3.2
ENVIRONMENTAL DATA	The substance is harmful to aquatic organisms. 	

N O T E S

The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-30S1175 or 30GF1-I+II
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

Naphthene
$C_{10}H_8$
Molecular mass: 128.18

ICSC # 0667
CAS # 91-20-3
RTECS # QJ0525000
UN # 1334 (solid); 2304 (molten)
EC # 601-052-00-2
April 21, 2005 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Headache. Weakness. Nausea. Vomiting. Sweating. Confusion. Jaundice. Dark urine.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! (Further see Inhalation).	Protective gloves.	Rinse skin with plenty of water or shower.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Convulsions. Unconsciousness. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, food and feedstuffs . Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 22-40-50/53 S: 2-36/37-46-60-61 UN Hazard Class: 4.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0667

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
WHITE SOLID IN VARIOUS FORMS , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
On combustion, forms irritating and toxic gases. Reacts with strong oxidants .

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 10 ppm as TWA; 15 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen); (ACGIH 2005).
MAK: skin absorption (H);
Carcinogen category: 2; Germ cell mutagen group: 3B; (DFG 2004).
OSHA PEL†: TWA 10 ppm (50 mg/m^3)
NIOSH REL: TWA 10 ppm (50 mg/m^3) ST 15 ppm (75 mg/m^3)
NIOSH IDLH: 250 ppm See: 91203

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. See Notes.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance may cause effects on the blood , resulting in lesions of blood cells (haemolysis) . See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the blood , resulting in chronic haemolytic anaemia. The substance may have effects on the eyes , resulting in the development of cataract. This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 218°C

Sublimation slowly at room temperature
Melting point: 80°C
Density: 1.16
g/cm³
Solubility in water, g/100 ml at 25°C:
none

Vapour pressure, Pa at 25°C: 11
Relative vapour density (air = 1): 4.42
Flash point:
80°C c.c.
Auto-ignition temperature: 540°C
Explosive limits, vol% in air: 0.9-5.9
Octanol/water partition coefficient as log Pow: 3.3

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Some individuals may be more sensitive to the effect of naphthalene on blood cells.

Transport Emergency Card: TEC (R)-41S1334 (solid); 41GF1-II+III (solid); 41S2304 (molten)

NFPA Code: H2; F2; R0;

ADDITIONAL INFORMATION

ICSC: 0667 **NAPHTHALENE**

IMPORTANT LEGAL NOTICE:

Material Safety Data Sheet

Normal-Butylbenzene, 99+%

ACC# 55434

Section 1 - Chemical Product and Company Identification

MSDS Name: Normal-Butylbenzene, 99+%
Catalog Numbers: AC107850000, AC107850050, AC107850250, AC107850500, AC107851000, AC107852500 AC107852500
Synonyms: 1-Phenylbutane
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
104-51-8	n-Butylbenzene	>99	203-209-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 59 deg C.
Warning! Flammable liquid and vapor. May cause eye and skin irritation. May cause respiratory and digestive tract irritation. The toxicological properties of this material have not been fully investigated.
Target Organs: Liver, nervous system.

Potential Health Effects

Eye: May cause eye irritation. The toxicological properties of this material have not been fully investigated.
Skin: May cause skin irritation. The toxicological properties of this material have not been fully investigated.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. The toxicological properties of this substance have not been fully investigated.
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. Vapors may cause dizziness or suffocation.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Use agent most appropriate to extinguish fire. Do NOT use straight streams of water.
Flash Point: 59 deg C (138.20 deg F)
Autoignition Temperature: 412 deg C (773.60 deg F)
Explosion Limits, Lower:.80 vol %
Upper: 5.80 vol %
NFPA Rating: (estimated) Health: 1; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
n-Butylbenzene	none listed	none listed	none listed

OSHA Vacated PELs: n-Butylbenzene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: 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: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Wear a NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode with emergency escape provisions. 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.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: None reported.
pH: Not available.
Vapor Pressure: 1.33 hPa @ 23 C
Vapor Density: 4.6
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 183 deg C @ 760.00mm Hg
Freezing/Melting Point:-88 deg C
Decomposition Temperature:> 183 deg C
Solubility: insoluble
Specific Gravity/Density:.8600g/cm3
Molecular Formula:C10H14
Molecular Weight:134.22

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat, strong oxidants.
Incompatibilities with Other Materials: Oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 104-51-8: CY9070000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 104-51-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: Rapidly volatilizes into the atmosphere where it is photochemically degraded by hydroxyl radicals.

Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	BUTYL BENZENES	No information available.
Hazard Class:	3	
UN Number:	UN2709	
Packing Group:	III	

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 104-51-8 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 104-51-8: Effective 6/1/87, Sunset 12/19/95
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 104-51-8: immediate, fire.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 104-51-8 can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

R 10 Flammable.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 24/25 Avoid contact with skin and eyes.
S 33 Take precautionary measures against static discharges.
S 37 Wear suitable gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 9 Keep container in a well-ventilated place.
S 28A After contact with skin, wash immediately with plenty of water
.

WGK (Water Danger/Protection)

CAS# 104-51-8: 1

Canada - DSL/NDSL

CAS# 104-51-8 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B3, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

Section 16 - Additional Information

MSDS Creation Date: 4/15/1998
Revision #4 Date: 3/16/2007

Material Safety Data Sheet

Version 4.0
Revision Date 07/28/2010
Print Date 12/07/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Propylbenzene
Product Number	:	P52407
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid

Target Organs

Lungs, Eyes, Kidney

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Ingestion Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1-Phenylpropane

Formula : C_9H_{12}
Molecular Weight : 120.19 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Propylbenzene			
103-65-1	203-132-9	601-024-00-X	-

4. 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
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

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 and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
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 in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

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).

Hand protection
For prolonged or repeated contact use protective gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-99 °C (-146 °F) - lit.
Boiling point	159 °C (318 °F) - lit.
Flash point	42.0 °C (107.6 °F) - closed cup
Ignition temperature	450 °C (842 °F)
Lower explosion limit	0.8 %(V)
Upper explosion limit	6 %(V)
Density	0.862 g/cm3 at 25 °C (77 °F)
Water solubility	slightly soluble

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 6,040 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - rat - 2 h - 65000 ppm

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

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

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Damage to the lungs., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: DA8750000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 1.55 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. 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: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propyl benzene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2364 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: PROPYLBENZENE
Marine pollutant: No

IATA
UN-Number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propylbenzene

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: 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
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	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

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 Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0084
CAS # 95-47-6
RTECS # ZE2450000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 32°C explosive vapour/air mixtures may be formed.	Above 32°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants strong acids	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0084

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

I M P O R T A N T D A T A

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts with strong acids strong oxidants

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001).
MAK: 100 ppm 440 mg/m³
Peak limitation category: II(2)
skin absorption (H);
Pregnancy risk group: D
(DFG 2005).
EU OEL: 50 ppm as TWA 100 ppm as STEL
(skin)
(EU 2000).
OSHA PEL†: TWA 100 ppm (435 mg/m^3)
NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
NIOSH IDLH: 900 ppm See: 95476

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 144°C
Melting point: -25°C
Relative density (water = 1): 0.88
Solubility in water:
none
Vapour pressure, kPa at 20°C: 0.7

Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 32°C c.c.
Auto-ignition temperature: 463°C
Explosive limits, vol% in air: 0.9-6.7
Octanol/water partition coefficient as log Pow: 3.12

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0086 p-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

para-Xylene
1,4-Dimethylbenzene
p-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0086
CAS # 106-42-3
RTECS # ZE2625000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants, strong acids	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0086

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts with strong acids strong oxidants **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001). MAK: 100 ppm 440 mg/m³ Peak limitation category: II(2) skin absorption (H); Pregnancy risk group: D (DFG 2005). EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) NIOSH IDLH: 900 ppm See: 95476 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 138°C Melting point: 13°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 528°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.15
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. 

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0086 **p-XYLENE**

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

meta-Xylene
1,3-Dimethylbenzene
m-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0085
CAS # 108-38-3
RTECS # ZE2275000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)	Fireproof. Separated from strong oxidants strong acids	Note: C Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0085

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts with strong acids strong oxidants **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA 150 ppm as STEL A4 (ACGIH 2001). BEI (ACGIH 2001). MAK: 100 ppm 440 mg/m³ Peak limitation category: II(2) skin absorption (H); Pregnancy risk group: D (DFG 2005). EU OEL: 50 ppm as TWA 100 ppm as STEL (skin) (EU 2000). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) NIOSH IDLH: 900 ppm See: 95476 **ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 139°C Melting point: -48°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.8 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 527°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.20
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. 

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0086 p-Xylene.

NFPA Code: H 2; F 3; R 0;
Transport Emergency Card: TEC (R)-30S1307-III

ADDITIONAL INFORMATION

ICSC: 0085 **m-XYLENE**

International Chemical Safety Cards

p-CYMENE

ICSC: 0617

1-Methyl-4-isopropylbenzene
Dolcymene
Camphogen
$C_{10}H_{14}$ / $CH_3C_6H_4CH(CH_3)_2$
Molecular mass: 134.2

ICSC # 0617
CAS # 99-87-6
RTECS # GZ5950000
UN # 2046
November 04, 1997 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Above 47°C explosive vapour/air mixtures may be formed.	Above 47°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•**INHALATION**	Dizziness. Drowsiness. Vomiting.	Ventilation.	Fresh air, rest. Half-upright position. Artificial respiration if indicated. Refer for medical attention.
•**SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Wear protective gloves when administering first aid.
•**EYES**	Redness.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Diarrhoea. Drowsiness. Headache. Nausea. Vomiting. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. (Extra personal protection: filter respirator for organic gases and vapours).	Fireproof.	UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0617

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

p-CYMENE

ICSC: 0617

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** The vapour is heavier than air. **CHEMICAL DANGERS:** Reacts with oxidants. Attacks rubber. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour and by ingestion. **INHALATION RISK:** No indication can be given about the rate in which a harmful concentration in the air is reached on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin . Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin.
PHYSICAL PROPERTIES	Boiling point: 177°C Melting point: -68°C Relative density (water = 1): 0.85 Solubility in water, g/100 ml at 25°C: 0.002 Vapour pressure, Pa at 20°C: 200	Relative vapour density (air = 1): 4.62 Flash point: 47°C c.c. Auto-ignition temperature: 435°C Explosive limits, vol% in air: 0.7-5.6 Octanol/water partition coefficient as log Pow: 4.1
ENVIRONMENTAL DATA		

N O T E S

Transport Emergency Card: TEC (R)-30G35

NFPA Code: H2; F2; R0;

ADDITIONAL INFORMATION

ICSC: 0617 **p-CYMENE**

Material Safety Data Sheet

Version 4.0
Revision Date 07/24/2010
Print Date 12/07/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	*sec*-Butylbenzene
Product Number	:	B90408
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid, Irritant

GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H315 + H320	Causes skin and eye irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 2-Phenylbutane

Formula	:	$C_{10}H_{14}$
Molecular Weight	:	134.22 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
sec-Butylbenzene			
135-98-8	205-227-0	-	-

4. 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
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

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 and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
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 in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

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).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	75.5 °C (167.9 °F) - lit.
Boiling point	173 - 174 °C (343 - 345 °F) - lit.
Flash point	52.0 °C (125.6 °F) - closed cup
Ignition temperature	418 °C (784 °F)
Lower explosion limit	0.8 %(V)
Density	0.863 g/mL at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Dermal - rabbit - > 13,792 mg/kg

Skin corrosion/irritation
Skin - rabbit - irritating - 24 h

Serious eye damage/eye irritation
Eyes - rabbit - Mild eye irritation - 24 h

Respiratory or skin sensitization
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.
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

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: CY9100000

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. 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: 2709 Class: 3 Packing group: III
Proper shipping name: Butyl benzenes
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2709 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: BUTYLBENZENES
Marine pollutant: No

IATA
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butylbenzenes

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid, Irritant

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
sec-Butylbenzene	135-98-8

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: 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
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
sec-Butylbenzene	135-98-8	

New Jersey Right To Know Components

	CAS-No.	Revision Date
sec-Butylbenzene	135-98-8	

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

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 Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

International Chemical Safety Cards

TOLUENE

ICSC: 0078

Methylbenzene
Toluol
Phenylmethane
$C_6H_5CH_3$ / C_7H_8
Molecular mass: 92.1

ICSC # 0078
CAS # 108-88-3
RTECS # XS5250000
UN # 1294
EC # 601-021-00-3
October 10, 2002 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•**INHALATION**	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•**SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•**EYES**	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•**INGESTION**	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in large spill! Consult an expert in large spill! Remove all ignition sources. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: self-contained breathing apparatus	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-38-48/20-63-65-67 S: 2-36/37-46-62 UN Hazard Class: 3 UN Packing Group: II

ICSC: 0078

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

TOLUENE

ICSC: 0078

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour mixes well with air, explosive mixtures are formed easily. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 50 ppm as TWA (skin) A4 BEI issued (ACGIH 2004).
MAK: 50 ppm 190 mg/m³ H
Peak limitation category: II(4) Pregnancy risk group: C (DFG 2004).
OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)
NIOSH REL: TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)
NIOSH IDLH: 500 ppm See: 108883

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the respiratory tract The substance may cause effects on the central nervous system If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels may result in cardiac dysrhythmiaandunconsciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 111°C
Melting point: -95°C
Relative density (water = 1): 0.87
Solubility in water: none
Vapour pressure, kPa at 25°C: 3.8
Relative vapour density (air = 1): 3.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 4°C c.c.
Auto-ignition temperature: 480°C
Explosive limits, vol% in air: 1.1-7.1
Octanol/water partition coefficient as log Pow: 2.69

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Use of alcoholic beverages enhances the harmful effect.

Transport Emergency Card: TEC (R)-30S1294
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

ICSC # 0385
CAS # 56-55-3
RTECS # CV9275000
EC # 601-033-00-9
October 23, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: complete protective clothing including self-contained breathing apparatus.	Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ICSC: 0385

BENZ(a)ANTHRACENE

I M P O R T A N T D A T A

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO YELLOW BROWN FLUORESCENT FLAKES OR POWDER.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS:
TLV: A2 (suspected human carcinogen); (ACGIH 2004).
MAK:
Carcinogen category: 2 (as pyrolysis product of organic materials)
(DFG 2005).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Sublimation point: 435°C
Melting point: 162°C
Relative density (water = 1): 1.274
Solubility in water:
none

Vapour pressure, Pa at 20°C: 292
Octanol/water partition coefficient as log Pow: 5.61

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in seafood.

N O T E S

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name. Card has been partly updated in October 2005 and August 2006: see sections Occupational Exposure Limits, EU classification.

ADDITIONAL INFORMATION

ICSC: 0385 **BENZ(a)ANTHRACENE**

International Chemical Safety Cards

BENZO(k)FLUORANTHENE

ICSC: 0721

Dibenzo(b,jk)fluorene
8,9-Benzofluoranthene
11,12-Benzofluoranthene
$C_{20}H_{12}$
Molecular mass: 252.3

ICSC # 0721
CAS # 207-08-9
RTECS # DF6350000
EC # 601-036-00-5
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	T symbol N symbol R: 45-50/53 S: 53-45-60-61

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0721

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZO(k)FLUORANTHENE

ICSC: 0721

I **M**	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

P O R T A N T D A T A	**PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004). **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 217°C Solubility in water: none Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish. 

N O T E S

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0721 **BENZO(k)FLUORANTHENE**

International Chemical Safety Cards

CHRYSENE

ICSC: 1672

Benzoaphenanthrene
1,2-Benzophenanthrene
1,2,5,6-Dibenzonaphthalene
$C_{18}H_{12}$
Molecular mass: 228.3

ICSC # 1672
CAS # 218-01-9
RTECS # GC0700000
UN # 3077
EC # 601-048-00-0
October 12, 2006 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray. Dry powder. Foam. Carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: P3 filter respirator for toxic particles. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.	T symbol N symbol R: 45-68-50/53 S: 53-45-60-61 UN Hazard Class: 9 UN Packing Group: III Signal: Warning Aqua-Cancer Suspected of causing cancer Very toxic to aquatic life with long lasting effects Very toxic to aquatic life

SEE IMPORTANT INFORMATION ON BACK

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European

International Chemical Safety Cards

CHRYSENE

ICSC: 1672

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO BEIGE CRYSTALS OR POWDER

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
The substance decomposes on burning producing toxic fumes Reacts violently with strong oxidants

OCCUPATIONAL EXPOSURE LIMITS:
TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2006).
MAK not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

INHALATION RISK:
A harmful concentration of airborne particles can be reached quickly when dispersed

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 448°C
Melting point: 254 - 256°C
Density: 1.3 g/cm³

Solubility in water:
very poor
Octanol/water partition coefficient as log Pow: 5.9

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised that this substance does not enter the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. This substance does not usually occur as a pure substance but as a component of polyaromatic hydrocarbon (PAH) mixtures. Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.

Transport Emergency Card: TEC (R)-90GM7-III

ADDITIONAL INFORMATION

International Chemical Safety Cards

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

o-Phenylenepyrene
2,3-Phenylenepyrene
$C_{22}H_{12}$
Molecular mass: 276.3

ICSC # 0730
CAS # 193-39-5
RTECS # NK9300000
March 25, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION		Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Well closed.	R: S:

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0730

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

INDENO(1,2,3-cd)PYRENE

ICSC: 0730

I **M** **P**	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS **PHYSICAL DANGERS:**	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:**

O R T A N T D A T A	**CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS:** TLV not established. MAK: Carcinogen category: 2; (DFG 2004).	Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 536°C Melting point: 164°C Solubility in water: none	Octanol/water partition coefficient as log Pow: 6.58
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish. 	

N O T E S

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m^3. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0730 **INDENO(1,2,3-cd)PYRENE**

APPENDIX D

HOSPITAL INFORMATION AND MAP

FIELD ACCIDENT REPORT

FIELD ACCIDENT REPORT

This report is to be filled out by the designated Site Safety Officer after EVERY accident.

PROJECT NAME _____ PROJECT. NO._____

Date of Accident _____ Time _____ Report By _____

Type of Accident (Check One):

( ) Vehicular ( ) Personal ( ) Property

Name of Injured _____ DOB or Age _____

How Long Employed _____

Names of Witnesses _____

_____

Description of Accident _____

_____

_____

Action Taken _____

_____

_____

Did the Injured Lose Any Time? _____ How Much (Days/Hrs.)? _____

Was Safety Equipment in Use at the Time of the Accident (Hard Hat, Safety Glasses, Gloves, Safety Shoes, etc.)? _____

_____

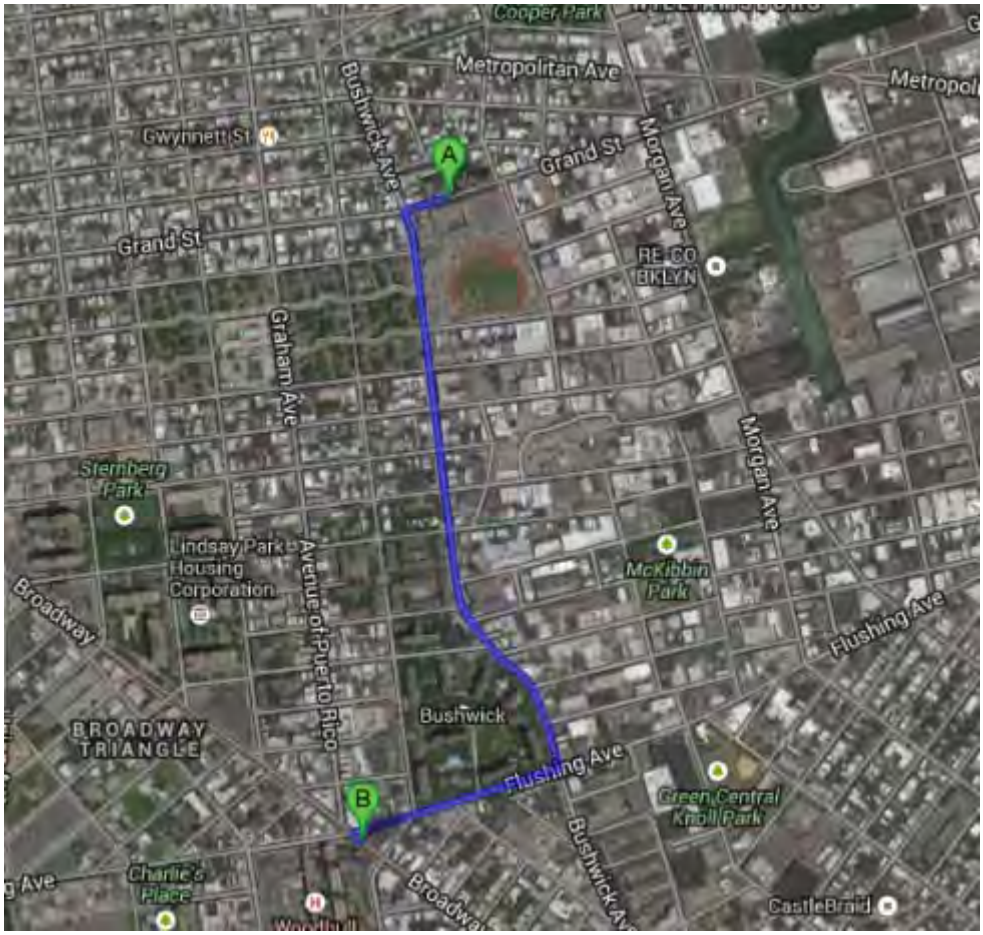
(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

HOSPITAL INFORMATION AND MAP

The hospital nearest the site is:

WOODHUL MEDICAL CENTER
760 Broadway, Brooklyn, New York 11206
718-963-8000
1.1 Miles – About 4 Minutes



A 845 Grand St, Brooklyn, NY 11211

1.	Head **west** on **Grand St** toward **Bushwick Ave**	go 299 ft total 299 ft
2.	Take the 1st left onto **Bushwick Ave** About 2 mins	go 0.7 mi total 0.8 mi
3.	Turn right onto **Flushing Ave** About 1 min	go 0.3 mi total 1.1 mi
4.	Turn left onto **Broadway** Destination will be on the right	go 82 ft total 1.1 mi

B **Woodhull Medical Center**
760 Broadway, Brooklyn, NY 11206

ATTACHMENT H
SITE MANAGEMENT FORMS

845 Grand Street, Brookjlyn, NY
SVE System Monitoring Form

Date / Time: _____
Technician: _____

System Operating (Yes / No)

System Parameters

Influent Flow Meter	_____	SCFM
Influent Vacuum	_____	"H2O
Bleed valve position	_____	

Sample Ports

	PID (ppm)	Sampled	Analysis / Comments
Pre-GAC			
Mid-GAC			
Post-GAC			

Repairs / Modifications / Comments

SITE INSPECTION CHECKLIST

Site Inspection Checklist - Cover System
845 Grand Street
Brooklyn, NY

Date: _____ Time: _____

Inspector Name/Organization: _____

Visual Inspection of Cellar Concrete Slab

Inspect basement concrete slab for cracks, perforations and patching

Describe General Condition of Slab _____

_____

Describe any Cracks or New Penetrations _____

_____

Describe any Patching _____

_____

Visual Inspection of Cellar Level Rear Courtyard Pavers

Inspect for missing pavers, evidence of replacement or recent excavation

Describe General Condition of Pavers _____

_____

Describe areas of missing pavers and disturbed areas _____

_____

Describe any areas that have been recently replaced _____

_____

Visual Inspection of Soil Cap in Rear Planter Area

Describe General Condition of Cover _____

_____

Describe any Soil Disturbance or Changes _____

_____

_____

_____

Repairs Needed and / or Maintenance at this time?

_____

_____

_____

_____

Signature: _____ Date: _____

ATTACHMENT I
O&M MANUAL

OPERATION AND MAINTENANCE PLAN

1.0 INTRODUCTION

This Operation and Maintenance Plan describes the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the steps necessary to allow individuals unfamiliar with the site to operate and maintain the SVE system;
- Includes an operation and maintenance contingency plan; and,
- Will be updated periodically to reflect changes in site conditions or the manner in which the SVE systems are operated and maintained.

A copy of this Operation and Maintenance Plan will be kept at the site.

1.1 SVE System Scope

The SVE systems at the site will operate 24/7 with no maintenance requirements. Periodic montly inspections will be performed to assure that the system is continuing to operate properly..

1.2 SVE System Start-Up and Testing

The start-up test procedure will first consist of a visual inspection to make sure all of the system components are installed properly. Following this, the system will be started and checked for leaks and adequate vacuum on the intake line and adequate pressure at the discharge stack. Negative pressure readings will be taken at several locations with a digital manometer. The system testing described above will be conducted if, in the course of the SVE system lifetime, significant changes are made to the system, and the system restarted.

1.3 SVE System Operation: Non-Routine Equipment Maintenance

The SVE systems are maintenance free. The fan should only stop operating in the event of a power outage or a severe blockage. In the event that the system trips and shuts down, the owner or owner's representative should be contacted for repairs.

2.0 SVE SYSTEM PERFORMANCE MONITORING

An SVE system has been installed to remediate impacted soils within the source area.

2.1 SVE Monitoring Schedule

The components of the SSDS system will be inspected by a qualified environmental professional or technician on a monthly basis to assure that the system is functioning properly.

Unscheduled inspections and/or sampling may take place when a suspected failure of the SVE system has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

2.2 SVE General Equipment Monitoring

A visual inspection of the complete system will be conducted during the monitoring event. SVE system components to be monitored include, but are not limited to, the following:

- Vacuum blower; and,
- General system piping.
- Vacuum gauges.
- Control switches and system alarms.
- PIS Readings from influent line, between carbon drums and at the discharge stack.

A complete list of components to be checked is provided in the Inspection Checklist (attached). If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair as per the Operation and Maintenance Plan are required immediately, and the SVE system restarted.

2.3 SVE Sampling Event Protocol

Air samples will initially be collected on a monthly basis to evaluate the performance of the system. Samples will be collected from three locations: system influent (before carbon), between the carbon canisters and from the system discharge (after carbon). Air samples will be submitted to a NYSDOH certified environmental laboratory for analysis of VOCs by USEPA method TO15.

3.0 MAINTENANCE AND PERFORMANCE MONITORING REPORTING REQUIREMENTS

Maintenance reports and any other information generated during regular operations at the site will be kept on-file.

3.1 Routine Maintenance Reports

Checklists or forms (attached) will be completed during each routine maintenance event. Checklists/forms will include, but not be limited to the following information:

- Date;
- Name, company, and position of person(s) conducting maintenance activities;
- Maintenance activities conducted;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

3.2 Non-Routine Maintenance Reports

During each non-routine maintenance event, a form will be completed which will include, but not be limited to, the following information:

- Date;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Presence of leaks;
- Date of leak repair;
- Other repairs or adjustments made to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and,
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

ATTACHMENT J
REMEDIAL SYSTEM OPTIMIZATION
TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION FOR

FORMER BENNETT TRUCKING CORP.

ATTACHMENT K
COMMUNITY AIR MONITORING PLAN

COMMUNITY AIR MONITORING PLAN

FORMER BENNETT TRUCKING CORP. SITE
845 GRAND STREET
BROOKLYN, NY

JULY - 2015

FORMER BENNETT TRUCKING CORP SITE

COMMUNITY AIR MONITORING PLAN
TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been prepared for use during activities that disturb the building slab/foundation, rear cellar level courtyard slab or at-grade concrete slab around the cellar level rear courtyard. The CAMP provides measures for protection for the on-site works and building occupants and downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the investigation activities) from potential airborne contaminant releases resulting from investigative activities at the site.

Compliance with this CAMP is required during all activities associated with drilling and sampling activities that have the potential to generate airborne particulate matter and volatile organic compounds (VOCs). These activities include drilling and soil and groundwater sampling. This CAMP has been prepared to ensure that investigation activities do not adversely affect passersby, residents, or workers in the area immediately surrounding the Site and to preclude or minimize airborne migration of investigation-related contaminants to off-site areas.

1.1 Regulatory Requirements

This CAMP was established in accordance with the following requirements:

- New York State Department of Health's (NYSDOH) Generic Community Air Monitoring Plan as presented in DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC May 3, 2010). This guidance specifies that a community air-monitoring program shall be implemented to protect the surrounding community and to confirm that the work does not spread contamination off-site through the air;

- New York State Department of Environmental Conservation (NYSDEC) Technical and Guidance Memorandum (TAGM) #4031 - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites: This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2.0 AIR MONITORING

Chlorinated volatile organic compounds (VOCs) and petroleum VOCs are the constituents of concern at the Site. The appropriate method to monitor air for these constituents during remediation activities is through real-time VOC and air particulate (dust) monitoring.

2.1 Meteorological Data

At a minimum, wind direction will be evaluated at the start of each workday, noon of each workday, and the end of each workday. These readings will be utilized to position the monitoring equipment in appropriate upwind and downwind locations.

2.2 Community Air Monitoring Requirements

To establish ambient air background concentrations, air will be monitored at several locations around the site perimeter before activities begin. These points will be monitored periodically in series during the site work. When the drilling area is within 20 feet of potentially exposed populations or occupied structures, the perimeter monitoring points will be located to represent the nearest potentially exposed individuals at the downwind location.

Fugitive respirable dust will be monitored using a MiniRam Model PDM-3 aerosol monitor (or equivalent). Air will be monitored for VOCs with a portable Ionscience 3000 photoionization detector (PID), or equivalent. All air monitoring data will be documented in a site log book by the designated site safety officer. The site safety officer or delegate must ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. All instruments will be zeroed daily and checked for accuracy. A daily log will be kept. If additional monitoring is required, the protocols will be developed and appended to this plan

3.0 VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

Volatile organic compounds (VOCs) will be monitored within the work area and 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. 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.

- 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.

- 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.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

All readings will be recorded and made available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report, as shown in Appendix A, will be completed.

3.1 Potential Corrective Measures and VOC Suppression Techniques

If the 15-minute integrated VOC level at the downwind location persists at a concentration that exceeds the upwind level by more than 5 ppm but less than 25 ppm during remediation activities, then vapor suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive organic vapors:

- Collection of purge water in covered containers;
- storage of excess sample and drill cuttings in drums or covering with plastic

4.0 PARTICULATE MONITORING

Air monitoring for particulates (i.e., dust) will be performed continuously during drilling activities using both air monitoring equipment and visual observation at upwind and downwind locations. Monitoring equipment capable of measuring particulate matter smaller than 10 microns (PM_{10}) and capable of integrating (averaging) over periods of 15 minutes or less will be set up at upwind (i.e., background) and downwind locations, at heights approximately four to five feet above land surface (i.e., the breathing zone). Monitoring equipment will be MIE Data Ram monitors, or equivalent. The audible alarm on the particulate monitoring device will be set at 90 micrograms per cubic meter ($\mu g/m_3$). This setting will allow proactive evaluation of worksite conditions prior to reaching the action level of 100 $\mu g/m^3$ above background. The monitors will be calibrated at least once per day prior to work activities and recalibrated as needed thereafter. In addition, fugitive dust migration will be visually assessed during all intrusive work activities.

The following summarizes particulate action levels and the appropriate responses:

- If the downwind PM-10 particulate level is 100 $\mu g/m^3$ 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 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work must be stopped and an evaluation of activities initiated. Work can resume provided that dust suppression measures (as described in Section 2.3.1 below) and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. If an exceedance of the Action Limits occurs, an Action Limit Report as shown in **Appendix A** will be completed.

4.1 Potential Particulate Suppression Techniques

If the integrated particulate level at the downwind location exceeds the upwind level by more than 100 $\mu g/m_3$ at any time during drilling activities, then dust suppression techniques will be employed. The following techniques, or others, may be employed to mitigate the generation and migration of fugitive dusts:

- Placement of drill cuttings in drums or covering stockpiles with plastic;
- Misting of the drilling area with a fine water spray from a hand-held spray bottle

Work may continue with dust suppression techniques provided that downwind PM_{10} levels are not more than 150 $\mu g/m^3$ greater than the upwind levels.

There may also be situations where the dust is generated by drilling activities and migrates to downwind locations, but is not detected by the monitoring equipment at or above the action level. Therefore, if dust is observed leaving the working area, dust suppression techniques such as those listed above will be employed.

If dust suppression techniques do not lower particulates to below 150 $\mu g/m^3$, or visible dust persists, work will be suspended until appropriate corrective measures are identified and implemented to remedy the situation.

All air monitoring readings will be recorded in the field logbook and will be available for the NYSDEC and NYSDOH personnel to review.

5.0 DATA QUALITY ASSURANCE

5.1 Calibration

Instrument calibration shall be documented on instrument calibration and maintenance sheets or in the designated field logbook. All instruments shall be calibrated as required by the manufacturer. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

5.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on-site by the SSO for reference.

5.3 Data Review

The SSO will interpret all monitoring data based the established criteria and his/her professional judgment. The SSO shall review the data with the PM to evaluate the potential for worker exposure, upgrades/downgrades in level of protection, comparison to direct reading instrumentation and changes in the integrated monitoring strategy.

Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the PM.

6.0 RECORDS AND REPORTING

All air readings must be recorded on daily air monitoring log sheets and made available for review by personnel from NYSDEC and NYSDOH.

Daily Air Monitoring Log

Project Name: Former Bennett Trucking Corp. Site Date: _____

Project Location: 3845 Grand Street, Brooklyn, NY BCP No: C224181

Temperature:_____ Wind Speed:_____ Wind Direction:_____

Background Data: Upwind - PID _____ppm Dust Meter 1 - _____mg/m^3

Downwind - PID _____ppm Dust Meter 2 - _____mg/m^3

Time	Work Zone		Upwind		Downwind	
	PID - ppm	Dust - mg/m^3	PID - ppm	Dust - mg/m^3	PID - ppm	Dust - mg/m^3

Activities Performed: