PROPOSED REMEDIAL ACTION PLAN

Former Air Force Plant No. 51
Operable Unit Number 01: Former Plating Pond/Lagoon
State Superfund Project
Greece, Monroe County
Site No. 828156
August 2023

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

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SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy proposed by this Proposed Remedial Action Plan (PRAP). The disposal of hazardous wastes at this site, as more fully described in Section 6 of this document, has contaminated various environmental media. The proposed remedy is intended to attain the remedial action objectives (RAOs) identified for this site for the protection of public health and the environment. This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for the preferred remedy.

The New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York; (6 NYCRR) Part 375. This document is a summary of the information that can be found in the site-related reports and documents in the document repository identified below.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all PRAPs. This is an opportunity for public participation in the remedy selection process. The public is encouraged to review the reports and documents, which are available at the following repository:

GREECE PUBLIC LIBRARY
2 VINCE TOFANY BLVD
GREECE, NY 14612
Phone: 585.225.8951

Key project documents and project summary also are available on the NYSDEC website at: https://www.dec.ny.gov/data/DecDocs/828156/

A public comment period has been set from:

August 9, 2023 to September 7, 2023

A public meeting is scheduled for the following date:

Tuesday, August 22, 2023, from 6 PM to 8 PM
The Lodge at Adeline Park
124 Armstrong Road
Greece, NY 14616

At the meeting, the findings of the remedial investigation (RI) and the feasibility study (FS) will be presented along with a summary of the proposed remedy. After the presentation, a question and answer period will be held, during which verbal or written comments may be submitted on the PRAP.

Written comments may also be sent through 09/07/2023 to:

Gail Dieter
NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway – 12th Floor
Albany, NY 12233-7017
gail.dieter@dec.ny.gov

The Department may modify the proposed remedy or select another of the alternatives presented in this PRAP based on new information or public comments. Therefore, the public is encouraged to review and comment on the proposed remedy identified herein. Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Former Air Force Plant No. 51 site is located just north of the Lake Ontario State Parkway at 4777 Dewey Avenue, in the Town of Greece, Monroe County, New York. **See Figure #1**.

Site Features: The main site features once included a central complex of large and mid-size buildings surrounded by parking areas, roadways, and open fields. In 2015, the main building and several of the smaller buildings were demolished by the owner with only their concrete slabs now remaining. Four smaller buildings remain on the site (Bldg. No. 2, 7, 9, and 11). None of which are occupied at this time. Bldg. No. 3, 4, 5 (one structure) also remains, but is considered to be off-site.

Access to the site is not controlled.

Current Zoning and Land Use: The site is zoned Flexible Office/Industrial. The site is privately owned and is presently unoccupied.

Surrounding land use consists of commercial and residential use to the east, undeveloped wooded upland areas to the south and wooded upland areas leading to wetlands and Round Pond Creek to the west. The Monroe County Water Authority Shoremont Treatment Plant is located north of the site. An outparcel at 4771 Dewey Avenue is considered an off-site property, but it adjoins the site and was reportedly a part of the historic WWII Odenbach shipbuilding facility. This off-site parcel is currently under separate ownership and operation. The parcel shares driveway access to the site. The building (Building 3, 4, and 5) that currently exists on this parcel historically housed administrative offices, a cafeteria, and a medical facility.

Past Use of the Site: The plant was originally built during WWII by the Odenbach Shipbuilding Corp. for the production of ocean-going ships. To launch the ships, a water-filled channel was dredged from the north end of the shipyard to Round Pond Creek. Today, the remaining portion of the channel is used by the Shoremont Treatment Plant as a settling pond for sediments from filter backwashing.

After the war, the plant was used by the Department of Defense for the production of B-52 bulkheads and the name of the facility was changed to Air Force Plant 51. Records indicate that the A.O. Smith Corporation and the American Machine and Foundry Company occupied the site in the 1950s. In 1959, the facility was declared excess by the United States (U.S.) government. From 1961 to 1963 the property was owned by the Monroe County Water Authority. Since 1963, the facility has been owned by corporate relatives of the current owner with space leased to a variety of businesses including scrap metal recycling and metal plating.

U.S. Air Force contracts indicate that a plating operation was performed at the site prior to 1956 and that plating area rinse water drained to an on-site pond before flowing into Round Pond Creek. Other operations at the site that may have potentially contributed to site contamination include discharges from acetylene gas production; a variety of maintenance activities including vehicle maintenance; underground gasoline storage tanks; above ground storage tanks; electrical transformers; heat treating; degreasing; laboratory activities; metal plating activities from tenants in the 1970s; discharges to septic systems; and discharges to the storm sewer system which discharges to Round Pond Creek. Other activities not specifically identified above may have also contributed to the contamination of the site.

Over the past 15 years, numerous investigations have been conducted by the U.S. Army Corps of Engineers (USACE), by the current owner of the property under the Voluntary Cleanup Program (VCP), and by the Department under the State Superfund Program (SSF) to define the nature and extent of contamination and develop a plan to clean up the site. The Department is implementing a remedial program at the site while continuing to identify and pursue parties who are potentially responsible for the contamination in order to recover remediation costs. See the enforcement status (Section 5) below for the list of potentially responsible parties.

Operable Units: An operable unit (OU) represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate, or mitigate a release, threat of release or exposure pathway resulting from the on-site contamination.

Under the Voluntary Cleanup Program (VCP), the site was divided into seven OUs. (ref. Site #V00421 for information on the previous OU designations.) In January 2009, the owner determined that they could no longer afford the costs associated with the investigation and remediation activities and ended their participation in the VCP. The site is now being addressed under the State Superfund, and the previous OUs have been consolidated and renamed as follows:

Operable Unit 1 (OU1) refers to the former on-site lagoon/pond where wastewater associated with past site operations was discharged, and the northern portion of the former Building #1 slab. This Proposed Remedial Action Plan (PRAP) is being developed separately, but concurrently with an OU2/OU3 PRAP which will address the contamination associated with OU2/OU3. One public meeting will be held to present the proposed remedies for all three OUs.

Operable Unit 2 (OU2) encompasses soil, soil vapor, and groundwater (including soil vapor and bedrock groundwater beneath OU1 through OU3 on- and off-site) including the complex of buildings, former storage tanks, former vehicle maintenance facilities and transformer areas occupying the central portion of the site, the industrial sewers that discharged storm water and septic wastes to the wetlands via several outfalls, and other suspected disposal areas.

Operable Unit 3 (OU3) encompasses off-site areas including the adjacent forests, wetlands, Round Pond and Round Pond Creek.

The location of each OU is depicted on **Figure 2**.

Site Geology and Hydrogeology: The upper 1- to 6-feet of the site is composed of a layer of fill material consisting of soils with small amounts of concrete, asphalt, metal, brick, and wood. Soil beneath this fill layer generally consists of mixtures of silts, clays, some sands, and a lesser amount of gravel. Bedrock, consisting of a brick-red interbedded shale, siltstone, sandstone, and limestone of the Queenston Formation was encountered at an average depth of about 30-feet (ft) below ground surface (bgs). Groundwater is generally encountered within 2-ft of the ground surface. The groundwater flow direction on the west side of the former main Air Force Plant No. 51 building is away from the building slab toward the west and northwest. A groundwater divide trending approximately along the axis of the building slab northward toward the Monroe County Water Authority property appears to be present. Groundwater east of the building slab flows toward the east and northeast.

Operable Unit (OU) Number 01 is the subject of this document.

A Proposed Remedial Action Plan will be issued separately for OU 02 and OU 03.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to commercial use (which allows for industrial use) as described in Part 375-1.8(g) are/is being evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the investigation to the appropriate standards, criteria, and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include:

A.O Smith Corporation
Qubica AMP
Genesee Scrap & Tin Bailing, Co.
4800 Dewey Avenue, Inc.
U.S. Department of Defense
U.S. Air Force
U.S. Army Corps of Engineers
U.S. General Services Administration
U.S. Department of Commerce

The PRPs for the site declined to implement the full remedial program when requested by the Department. After the remedy is selected, the PRPs will again be contacted to assume responsibility for the remedial program. If an agreement cannot be reached with the PRPs, the Department will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the state for recovery of all response costs the state has incurred.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A Remedial Investigation (RI) for Former Plating Pond – OU1 has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the RI Report.

The following general activities are conducted during an RI:

- Research of historical information
- Geophysical survey to determine the lateral extent of wastes
- Test pit, soil borings, and monitoring well installations
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor
- Sampling of surface water and sediment
- Ecological and Human Health Exposure Assessments

The analytical data collected on this site for OU1 includes data for:

- groundwater	- surface water
- soil	- sediment

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data.

The contaminant(s) of concern identified for this Operable Unit at this site is/are:

trichloroethene (TCE)	1,1-dichloroethene (1,1-DCE)
cis-1,2-dichloroethene (DCE)	toluene
trans-1,2-dichloroethene	tetrachloroethylene (PCE)
1,1,2-trichloroethane (1,1,2-TCA)	vinyl chloride

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

The following IRM was performed at this site prior to the site entering the VCP and NYSDEC-led RI/FS activities.

Impacted soil, sediment, and surface water were removed from the former plating pond to a depth intersecting groundwater by the United States Army Corps of Engineers (USACE) during a 2000/2001 IRM. The pond was dewatered, and one foot of sediment was removed. Soil was also excavated down to the water table – a total depth of 8.5 to 9.5-feet. 82,980 gallons of water were removed, and 4,717 tons of sediment/soil was disposed of during this IRM. However, chlorinated volatile organic compounds (CVOCs) and dense non-aqueous phase liquid (DNAPL) confirmed to be trichloroethene (TCE), extended deeper than the excavation depth based on the results of subsequent confirmation sampling. Post-excavation sampling showed concentrations of trichloroethene (TCE) in groundwater as high as 14,000 parts per billion (ppb), and concentrations of TCE in soil as high as 1,900 parts per million (ppm). The former plating pond/lagoon was filled in following the sediment removal. At the completion of the IRM, a Construction Completion Report, entitled "Interim Removal Action Area 1 Final Completion Report", dated August 2001 was submitted.

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern at this site, a Fish and Wildlife Resources Impact Analysis (FWRIA) was deemed not necessary for OU 01.

Nature and Extent of Contamination:

Soil, sediment, and groundwater were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), and pesticides. Below is a summary of areas with documented contamination, based on investigations conducted to date.

For OU 1: Former Plating Pond/Lagoon –

The primary contaminants of concern for OU 1 include trichloroethene (TCE) and associated degradation products in the soil, sediment, and groundwater.

Soil: TCE was detected in the soils beneath the former pond at a maximum concentration of 1,900 ppm in IRM post-excavation sampling in 2001. Investigations conducted since have detected TCE at a maximum concentration of 5,500 ppm at a depth of 14 to 16 feet, which significantly exceeds the soil cleanup objectives (SCOs) for the protection of groundwater (0.47 ppm). TCE was also detected in the soils beneath the Building No. 1 slab at a maximum concentration of 0.79 ppm which exceeds the SCOs for the protection of groundwater (0.47 ppm). Contaminated soil within OU1, but outside of the plating pond, includes soil associated with the stormwater infrastructure and a limited area of surface soil. Surface soil contamination is limited to one sample location where benzo(a)pyrene was detected at a maximum concentration of 1.7 ppm at a depth interval of one foot, exceeding the SCO for commercial use (1 ppm).

A dense non-aqueous phase liquid (DNAPL) with a primary component of TCE (concentration of 250,000 ppm) has been detected in site monitoring wells at a thickness up to 1 foot.

Groundwater: TCE and associated degradation products were detected in the groundwater under the former on-site pond exceeding groundwater standards of 5 ppb. Following Interim Remedial Measures conducted on-site (during focused RI/FS and pilot testing activities), TCE has been detected at a maximum concentration of 1,100,000 ppb, vinyl chloride (VC) has been detected at a concentration up to 110,000 ppb and cis-1,2-dichloroethene (cis-1,2-DCE) has been detected at a maximum concentration up to 160,000 ppb. The other site contaminants – toluene, trans-1,2 dichloroethene, 1,1-dichloroethene (1,1-DCE), and tetrachloroethene (PCE) were detected at lesser concentrations as listed in Exhibit A, Table 1.

Sediment: TCE and associated degradation products were detected in the former plating pond sediment prior to the 2000 IRM at a maximum concentration of 10,000,000 ppb or 1% for TCE and 2,600 ppm for cis-1,2-dichloroethene. Contaminated sediment was addressed during the IRM, in which one foot of sediment was removed down to soil (see Section 6.2). The former plating pond/lagoon was filled in following the sediment removal and, therefore, no sediments remain in this operable unit.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching, or swallowing). This is referred to as *exposure.*

People who enter the site could contact contaminants in the soil or groundwater by walking on the site, digging or otherwise disturbing the ground surface. Contaminated groundwater at the site is not used for drinking or other purposes and the site is served by a public water supply that obtains water from a different source not affected by this contamination. People may come in contact with contaminants present in wetland sediments. Volatile organic compounds may move into the soil vapor (air spaces within the soil), which in turn may move into buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Because the site is vacant, inhalation of site contaminants in indoor air due to soil vapor intrusion does not represent a concern for the site in its current condition. However, the potential exists for the inhalation of site contaminants due to soil vapor intrusion for any future on-site development. Environmental sampling indicates that soil vapor intrusion may be a concern for several off-site buildings located in close proximity to the former main building.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for OU1 are:

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
- Prevent human exposure to DNAPL

RAOs for Environmental Protection

- Remove DNAPL and restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable
- Prevent the discharge of contaminants to surface water; and
- Remove the source of groundwater contamination.

Soil:

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Remove DNAPL and prevent migration of contaminants that would result in groundwater or surface water contamination

Sediment:

RAOs for Public Health Protection

- Prevent direct contact with contaminated sediments
- Prevent surface water contamination which may result in fish advisories

RAOs for Environmental Protection

- Prevent releases of contaminants from sediments that would result in surface water levels in excess of ambient water quality criteria;
- Prevent impacts to biota from ingestion/direct contact with sediments causing toxicity or impacts from bioaccumulation through the marine or aquatic food chain;
- Restore sediments to pre-release/background conditions to the extent feasible.

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.

SECTION 7: SUMMARY OF THE PROPOSED REMEDY

To be selected, the remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies, or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Section 6.5. Potential remedial alternatives for the Site's Operable Unit 01 were identified, screened, and evaluated in the FS report.

A summary of the remedial alternatives that were considered for this site's Operable Unit 01 is presented in Exhibit B. Cost information is presented in the form of present worth, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit C.

The basis for the Department's proposed remedy is set forth in Exhibit D.

The proposed remedy is referred to as the Source-Area Excavation with off-site disposal of contaminated media and No Further Action (NFA) for sediment that was addressed by the IRM. Long-term monitoring (LTM) is also included to ensure the effectiveness of the remedy.

Source-area removal includes the excavation of soil contaminated at levels above the SCOs for protection of groundwater; removal of DNAPL within the former plating pond area; and removal of contaminated soil associated with the stormwater infrastructure. Dewatering will be performed primarily to facilitate the excavation but will also result in the removal of existing product material and high dissolved concentrations of VOCs from the area. Contaminated groundwater from the dewatering operation will be collected and treated prior to discharge and/or off-site disposal. Soil backfill used at the site will meet the 6 NYCRR Part 375 criteria for Commercial Use and Protection of Groundwater SCOs.

This remedy will achieve Soil RAOs by removing contaminated soil and DNAPL. This remedy will achieve Groundwater RAOs by removing the sources of groundwater contamination (DNAPL and contaminated soil above SCOs for protection of groundwater), contaminated groundwater through dewatering during the excavation work, and by implementing a long-term monitoring program to ensure the remedy is effective.

Re-contamination of OU1 groundwater is not expected based on the following:

- The OU2 plume is located under the southwest portion of the site and based on contaminant distribution and groundwater flow information, is determined to be traveling in a generally westward direction. Sampling results from wells located in OU2, but near OU1 are not contaminated which confirms that the OU2 plume is not impacting OU1.
- Groundwater contamination found in OU3 is situated west of the AFP51 site. Based on data gathered, it also has been determined to be traveling westerly.
- Based on the distances of the OU2 and OU3 plumes from OU1, the groundwater flow directions and gradients, and the geologic conditions and groundwater flow velocities, the OU2 and OU3 plumes will not re-contaminate OU1.

A long-term monitoring program is also included in the remedy. Soil in OU1 outside the plating pond and in OU2 will be addressed as part of the remedy for OU2 and will further reduce the likelihood of re-contamination of OU1 groundwater.

The estimated present worth cost to implement the remedy is $5,869,504. The cost to construct the remedy is estimated to be $4,579,521 and the estimated average annual cost is $65,585.

The elements of the proposed remedy are as follows:

1). <u>Remedial Design</u>

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;

- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of constructions

See Attachments 1 thru 7 for Environmental Footprint Analysis for proposed alternatives for OU1.

2). <u>Excavation</u>

Excavation and off-site disposal of contaminant source areas as outlined further below, including:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u);
- concentrated solid or semi-solid hazardous substances per 6 NYCRR Part 375-1.2(au)(1);
- non-aqueous phase liquids;
- soil with visual waste material or non-aqueous phase liquid;
- soils which exceed the protection of groundwater soil cleanup objectives (PGWSCOs), as defined by NYCRR Part 375-6.8 for those contaminants found in site groundwater above standards; and
- soils that create a nuisance condition, as defined in Commission Policy CP-51 Section G.

Excavation and off-site disposal of all soils in OU1 which exceed commercial SCOs, as defined by 6 NYCRR Part 375-6.8.

Approximately 9,700 cubic yards (yd^3) of contaminated soil will be removed from the site.

On-site soil which does not exceed the above excavation criteria may be used to backfill the excavation above the groundwater table. On-site soil which does not exceed the protection of groundwater SCOs for any constituent may be used/re-used on-site, including beneath the water table, to backfill the excavation or re-grade the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) (Commercial Use and Protection of Groundwater criteria) will be brought in to complete the backfilling of the excavation and establish the designed grades at the site.

Dewatering will be performed to facilitate the excavation. Contaminated groundwater from dewatering operations will be treated as necessary prior to discharge to the municipal sewer system.

3). Institutional Controls

Imposition of an institutional control in the form of an environmental easement and a Site Management Plan for the controlled property which will:

- require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8(h)(3);
- allow the use and development of the controlled property for commercial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or county DOH; and
- require compliance with a Site Management Plan (SMP).

The SMP will include monitoring and inspection requirements to assess the performance and effectiveness of the remedy. The plan will include groundwater monitoring requirements and frequency, inspection frequency, and periodic reporting requirements.

4). Site Management Plan

A Site Management Plan is required for OU1, which includes the following:

a). An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and any off-site impacts, and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in remedy element 3 above.

The plan includes, but may not be limited to:

- descriptions of the provisions of the environmental easement including any land use and groundwater restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any building(s) developed on OU1, including provision for implementing actions recommended to address exposures related to vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b). A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring groundwater to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department; and

- monitoring for vapor intrusion for any building(s) developed on the site, and any occupied buildings adjacent to the site, as may be required by the Institutional and Engineering Control Plan discussed above.

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation for all environmental media that were evaluated. As described in Section 6.1, samples were collected from various environmental media to characterize the nature and extent of contamination.

For each medium for which contamination was identified, a table summarizes the findings of the investigation. The tables present the range of contamination found at the site in the media and compares the data with the applicable SCGs for the site. The contaminants are arranged into only one category: volatile organic compounds (VOCs). For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use. For soil, if applicable, the Restricted Use SCGs identified in Section 4 and Section 6.1.1 are also presented.

Waste/Source Areas

As described in the RI report, waste/source materials were identified at the site and are/were impacting groundwater and soil.

Wastes are defined in 6 NYCRR Part 375-1.2 (aw) and include solid, industrial and/or hazardous wastes. Source areas are defined in 6 NYCRR Part 375 (au). Source areas are areas of concern at a site where substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium. Wastes and source areas were identified at the site in the 2019 Remedial Investigation Report – Former Plating Pond (OU1). OU1 is defined as the former on-site lagoon/pond (source area) and the northern portion of the former Building #1 slab, dense non-aqueous phase liquid (DNAPL) and associated impacted groundwater.

Waste/source materials identified at the Former Air Force Plant No. 51 (AFP51) Operable Unit 1 (OU1) include a former on-site lagoon/pond area located to the northwest of former Building #1. During past site operations, the plating pond was used as a discharge location for plant operation wastewater from floor drains within Building #1. The floor drains in the northwestern part of Building #1 were directed to catch basin CB-1, which were then directed to the former plating pond.

Due to the concern of a likely connection to contamination encountered in wells near the northwest corner of Building #1 where floor drains existed, OU1 also includes the northwest corner of Building #1 and CB-1 as the potential source of contamination to the former plating pond.

Contaminated sediment was previously removed during the 2000/2001 interim remedial measure (IRM) performed by the United States Army Corp of Engineers (USACE). Remaining soil contamination is at depths approximately 12-feet below ground surface (bgs) and is being addressed as it is considered a continuing source for groundwater contamination. Dense non-aqueous phase liquid (DNAPL) with a primary component of TCE has been observed and recovered in monitoring wells within OU1 and is entrained in the soil. DNAPL has been found at depths ranging between approximately 14- and 23-feet bgs entrained in the more permeable layers of soil. A total of approximately 200 gallons of DNAPL was recovered during individual gauging and recovery events conducted between 2003 and 2008 and again from 2014-2018.

The DNAPL and associated impacted groundwater extends to the southeast of the former pond and includes the north end of the former Building #1 slab where trichloroethene (TCE) has been detected in groundwater at concentrations exceeding 100,000 part per billion (ppb). Contaminated vadose zone soil and soil vapor beneath the former Building #1 slab remain in Operable Unit 2 (OU2).

The nature and extent of the CVOC contamination has been delineated. The contamination does not appear to have migrated outside the footprint of the former plating pond. The contamination is centered within the footprint of the former plating pond, extending to depths of 20 feet bgs.

The waste/source areas identified will be addressed in the remedy selection process.

Groundwater

Groundwater samples were collected from overburden wells at a depth of 20-feet below the ground surface. The samples were collected to assess groundwater conditions at OU1. The results indicate that contamination in the overburden exceeds the SCGs for volatile organic compounds.

Table 1 - Groundwater

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG (based on RI/FS)
VOCs			
1,1-Dichloroethene	1.0 (non-detect) - 290	5	1/15
trans-1,2-Dichloroethene	1.0 (non-detect) – 2,000	5	1/15
Vinyl Chloride	1.0 (non-detect) – 110,000	2	10/15
cis-1,2-Dichloroethene	1.0 (non-detect) – 160,000	5	13/15
Trichloroethene	1.2 – 1,100,000	5	7/15
Toluene	1.0 (non-detect) - 16	5	2/15
Tetrachloroethylene	1.0 (non-detect) – 1.6	5	0/15
1,1,2-Triclorothane	1.0 (non-detect) – 2.6	1	2/15

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water. CVOC maximum concentrations consider OU1 RI/FS data and OU1 pilot study data.
b- SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).

The primary groundwater contaminants are 1,1-dichloroethene, trans-1,2-dichloroethene, vinyl chloride, cis-1,2-dichloroethene, and trichloroethene associated with the wastewater from past plant operations within Building #1 that were formerly discharged to the former on-site lagoon/pond area located to the northwest of former Building #1. The impacted groundwater extends to the southeast of the former pond and includes the north end of the former Building #1 slab where TCE has been detected in groundwater. See Figure 3.

Based on the findings of the RI, the past disposal of hazardous waste has resulted in the contamination of the overburden groundwater. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: 1,1-dichloroethene, trans-1,2-dichloroethene, vinyl chloride, cis-1,2-dichloroethene, and trichloroethene. Toluene, tetrachloroethene, and 1,1,2-trichloroethane are not contaminants driving the remediation of groundwater.

Soil

Following the 2000/2001 IRM conducted by USACE, soil samples were collected to determine remaining concentrations following soil removal. The post-excavation soil sample results were compared to the applicable Soil Cleanup Objectives (SCOs) for unrestricted use and restricted use/protection of groundwater, as discussed in Section 3, and indicate that the primary contaminants of concern on-site are CVOCs, specifically 1,1-dichloroethene, trans-1,2-dichloroethene, vinyl chloride, cis-1,2-dichloroethene, and trichloroethene. Impacted soil exceeding the Recommended Soil Cleanup Objectives (RSCOs) were observed in several soil borings beginning at 12-feet bgs and were observed to a depth of 17.5-feet bgs. See Figure 4. Based on the comparison of the soil sampling results to groundwater results, due to presence of CVOCs above groundwater standards, the protection of groundwater SCOs were selected for the evaluation of the data.

Contaminated soil within OU1, but outside of the plating pond, includes soil associated with the stormwater infrastructure and a limited area of surface soil. The stormwater infrastructure will be remediated partially as part of OU1 and completed as part of the future OU2 remedy. The remedy will include the excavation of soils exceeding SCOs for protection of groundwater and commercial use along with the replacement of piping and catch basins. Surface soil contamination is limited to one sample location where benzo(a)pyrene was detected at a maximum concentration of 1.7 ppm at a depth interval between 2-inches and 1-foot which exceeds the SCO for commercial use (1 ppm).

In addition to the impacted soil, DNAPL remains at OU1 and was identified at depths between 14- and 23-feet bgs, typically entrained in the more permeable layers of soil and sometimes separated by less permeable layers. There are no longer discharges of DNAPL from on-site facilities/operations to the former plating pond, nor discharges from the former plating pond to the outfall lying west of the pond. Plating pond sediment and underlying soil was removed by the USACE to a depth intersecting the groundwater table during the 2000/2001 IRM. Visual observations of this area indicates that all sediment has been removed via the IRM and only native soils and backfill soils remain in the former plating pond footprint.

Table #2 - Soil

Detected Constituents	Concentration Range Detected[a]	Unrestricted SCG[b]	Frequency Exceeding SCG	Restricted Use SCG[c]	Frequency Exceeding SCG
VOCs					
1,1-Dichloroethene	ND to 0.033	0.33	0/53	500	0/53
trans-1,2-Dichloroethene	ND to 0.020	0.19	0/43	500	0/43
Vinyl Chloride	ND to 0.13	0.02	1/53	13	0/53
cis-1,2-Dichloroethene	ND to 1.9	0.25	3/43	500	0/43
Trichloroethene	ND to 5,500	0.47	16/53	200	4/53
Toluene	ND to 0.84	0.7	1/53	500	0/53
Tetrachloroethylene	ND to 1.1	1.3	0/53	150	0/53
1,1,2 -Trichlorothane	ND to 0.91	0.68	1/53	500	0/53

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
Note: The Restricted Use Soil Cleanup Objectives for Protection of Groundwater values for these selected constituents are the same as the Unrestricted Use Soil Cleanup Objectives
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for Commercial Use.

Based on the findings of the Remedial Investigation, the presence of DNAPL and historic operations at the site have resulted in the contamination of soil at OU1. The OU1 contaminants identified in soil which are the primary contaminants of concern to be addressed by the remedy selection process are, vinyl chloride, cis-1,2-dichloroethene, 1,1,2-trichloroethane, and trichloroethene.

Sediment

Sediment was present in the top foot of OU1 prior to the 2000/2001 IRM conducted by USACE. 82,980 gallons of contaminated pond water, and 4,700 tons of contaminated soil/sediment were removed from the bottom of the pond, down to the groundwater table. The contaminated water was pumped to tanks and disposed of off-site, and the soil/sediment was properly disposed of off-site and replaced with clean backfill. The backfill consisted of a one- to two-feet thick layer of permeable sand and gravel that was overlain with a 10- to 12-foot-thick layer of low permeability uncontaminated soil from off-site sources. After the USACE completed remediation work, confirmatory soil samples and one groundwater sample were collected. The sample results confirmed that soil left in place exceeded NYSDEC soil cleanup criteria. See *USACE Interim Removal Action Area 1 – Final Completion Report (Weston August 2001).* Based on the activities conducted during the IRM, all sediment within OU1 was removed, the former plating pond/lagoon has been filled in and contaminated sediment is no longer a concern at OU1.

Soil Vapor

The NYS Department of Health has developed guidance for evaluating and mitigating exposures from soil vapor intrusion within residences and the workplace based on the presence of volatile organics within subsurface soil, soil vapor, and groundwater. The presence of VOCs within soil and groundwater within OU1, at concentrations greater than NYSDEC commercial and protection of groundwater soil cleanup objectives and NYSDEC Groundwater Quality Standards (GWQS), represent potential sources for exposures related to soil vapor intrusion to structures under a potential future commercial development scenario.

Exhibit B

<u>Description of Remedial Alternatives</u>

The following alternatives were considered based on the remedial action objectives (see Section 6.5) to address the contaminated media identified at the site as described in Exhibit A.

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative leaves the site contaminants in OU1 that are already present in the groundwater in place and/or moving downgradient in the direction of groundwater flow. Contaminants, particularly chlorinated volatile organic compounds (CVOCs), will possibly degrade via natural processes and transform to form other compounds over time. It is assumed that land and groundwater resource use will not change over time and that any existing Institutional Controls (ICs) will remain in place and enforced by other regulatory programs.

Alternative 2: Dual-Phase Extraction for Source Area and In-Situ Bioremediation

This alternative would include installing and operating an active dual phase extraction (DPE) treatment system for area treatment followed by in-situ bioremediation. Long term monitoring (LTM) sampling will be conducted to evaluate for natural attenuation processes or monitored natural attenuation (MNA) to achieve the remediation goals for OU1. This alternative will achieve the RAOs for OU1 over time. LTM sampling will continue over a 10-year period.

Present Worth: ……………………………………………………………………………………..$5,848,431
Capital Cost: ……………………………………………………………………………………….$1,520,151
Annual Costs: ………………………………………………………………………………………..$622,323

Alternative 3: Dual-Phase Extraction for Source Area and In-Situ Chemical Oxidation

This alternative would include installing and operating an active dual phase extraction (DPE) treatment system for area treatment followed by in-situ chemical oxidation (ISCO). Long term monitoring (LTM) sampling will be conducted to evaluate for natural attenuation processes to achieve the remediation goals for OU1. This alternative will achieve the RAOs for OU1 over time. LTM sampling will continue over a 10-year period or until RAOs are met.

Present Worth: …………………………………………………………………………………… $6,203,511
Capital Cost: ……………………………………………………………………………………….$1,520,151
Annual Costs: ………………………………………………………………………………………..$927,760

Alternative 4: Dual-Phase Extraction for Source Area and a Downgradient Permeable Reactive Barrier

This alternative would include installing and operating an active dual phase extraction (DPE) treatment system for area treatment with a permeable reactive barrier (PRB) wall installed downgradient of OU1. Long term monitoring (LTM) sampling will be conducted to evaluate for natural attenuation processes to achieve the remediation goals for OU1. This alternative will achieve the RAOs for OU1 over time. LTM sampling will continue over a 15-year period or until RAOs are met.

Present Worth: ……………………………………………………………………………………..$6,596,502
Capital Cost: ………………………………………………………………………………………..$2,614,881
Annual Costs: …………………………………………………………………………………………..$87,951

Alternative 5: In-Situ Thermal Treatment

This alternative would include the use of in-situ thermal treatment (ISTT) using thermal conductive heating (TCH) technology to treat the source area contamination and Monitored Natural Attenuation (MNA) for the outlying monitoring wells. Long term monitoring (LTM) sampling will be conducted to evaluate for natural attenuation processes to achieve the remediation goals for OU1. This alternative will achieve the RAOs for OU1 over time. LTM sampling will continue over a 10-year period or until RAOs are met.

Present Worth: ……………………………………………………………………………………..$9,429,763
Capital Cost: ………………………………………………………………………………………..$7,995,566
Annual Costs: …………………………………………………………………………………………..$87,719

Alternative 6A: Source-Area Excavation and Off-Site Disposal (Protection GW SCO)

This alternative would include excavation and offsite disposal of contaminated saturated zone soil, DNAPL and groundwater. Excavation of source material to meet the Protection of Groundwater Soil Cleanup Objectives (SCOs). Groundwater will be controlled by driving sheet piles to bedrock prior to dewatering and excavation. This alternative will achieve the RAOs for OU1 over time. Long Term Monitoring sampling will continue over a 10-year period or until RAOs are met.

Present Worth: ……………………………………………………………………………………........$5,869,504
Capital Cost: ………………………………………………………………………………………..$4,579,521
Annual Costs: …………………………………………………………………………………………..$65,585

Alternative 6B: Source-Area Excavation and Off-Site Disposal (Commercial SCO)

This alternative would include excavation and offsite disposal of contaminated saturated zone soil, DNAPL and groundwater. Excavation of source material to meet the Commercial Use SCOs. Groundwater will be controlled by driving sheet piles to bedrock prior to dewatering and excavation. This alternative will achieve the RAOs for OU1 over time. Long Term Monitoring sampling will continue over a 10-year period or until RAOs are met.

Present Worth: ……………………………………………………………………………………..$5,673,308
Capital Cost: ………………………………………………………………………………………..$4,383,326
Annual Costs: …………………………………………………………………………………………..$65,585

Exhibit C

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
No Action	0	0	0
DPE for Source Area and In-Situ Bioremediation	1,520,151	622,323	5,848,431
DPE for Source Area and ISCO	1,520,151	927,760	6,203,511
DPE for Source Area and Downgradient PRB	2,614,881	87,951	6,596,502
ISTT	7,995,566	87,719	9,429,763
Source Area Excavation and Offsite Disposal (A) (B)	4,579,521 - A 4,383,326 - B	65,585 - A 65,585 - B	5,869,504 – A 5,673,308 - B

Exhibit D

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative #6A, Source-Area Excavation and Offsite Disposal (Protection of GW SCO) as the remedy for OU1. Alternative #6A would achieve the remediation goals for the site by excavation and offsite disposal of contaminated saturated zone soil, DNAPL, and groundwater, in addition to the previously completed IRM. The excavation of source material would meet the Protection of Groundwater Soil Cleanup Objectives (SCOs). Institutional Controls (ICs) will remain in place to prohibit groundwater use in the area and a LTM program will be initiated to monitor the contaminant reduction over time. A Pre-Design Investigation will be conducted to refine the design parameters. This alternative will achieve the RAOs for OU1 over time. Long-Term Monitoring sampling is projected to continue over a 10-year period or until RAOs are met. The elements of this remedy are described in Section 7. The proposed remedy is depicted in Figure #5.

Basis for Selection

The proposed remedy is based on the results of the RI and the evaluation of alternatives. The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

The proposed remedy (Alternative 6A) would satisfy this criterion by actively removing the source area contamination via excavation and offsite disposal. Any residual contamination will gradually reduce in concentrations through natural attenuation processes, including degradation, dilution, and dispersion, in the long term. Removal of the known contaminated areas will greatly reduce residual contamination after completion of excavation activities. Alternative 1 (No Action) does not provide any protection to public health and the environment and will not be evaluated further. Alternatives 2 through 6 are protective of human health and the environment and are expected to achieve groundwater RAOs throughout the remediation area over time. Alternative 6A provides the highest degree of protectiveness, since contaminants will be removed from the site within the shortest time period compared to the other alternatives. The NYSDEC Class GA GWQS is expected to be achieved within 11 years for Alternatives 5 and 6, within 20 years for Alternatives 2 and 3, and within 25 years for Alternative 4.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

Alternatives 2 through 5 will substantially reduce contaminant concentrations in the treatment area by application of in-situ processes. Alternative 6 will substantially reduce contaminant concentrations by removal of the source material. The remaining low concentration contamination within and outside the treatment or excavation areas would be further reduced based on natural attenuation to achieve RAOs over the long term. Alternatives 5 and 6 will meet GWQS within the shortest period.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. <u>Long-term Effectiveness and Permanence.</u> This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Among Alternatives 2 through 6, Alternative 6 provides the highest mass reduction of contamination in the shortest period through excavation, followed by Alternative 5 using ISTT. The heat generated during ISTT may also enhance natural attenuation of contaminants after cessation of operations. Alternative 2 may temporarily increase the level of contaminants as reductive dichlorination proceeds. If the process stalls at cis-1,2-DCE and VC, bioaugmentation would be necessary to fully remediate the groundwater under this alternative. ISCO treatment may also likely result in increased contaminant migration due to displacement during injections. Alternative 4 using DPE and downgradient PRB would provide the least mass reduction of contaminants in the treatment area. The success of Alternative 4 using downgradient PRB depends highly on the width of the hydraulic capture zone and residence time of the contaminated groundwater through the barrier. Some of the issues with a PRB are that the groundwater may bypass around, under, or over the barrier and insufficient time through the barrier resulting in contaminant breakthrough. Alternative 6 would be the most reliable mass reduction technology, followed by Alternative 5, followed by Alternatives 2, 3, and 4. Every alternative will rely on ICs and LTM for areas of groundwater contamination outside the active remediation zone.

4. <u>Reduction of Toxicity, Mobility or Volume.</u> Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternatives 2 through 6 will provide reduction of toxicity, mobility, and volume through treatment and removal of contaminants. Alternative 6 would be the most effective in reducing toxicity and volume of contamination in groundwater through removal, followed by Alternatives 5, 2, 3, and 4, respectively.

Alternative 2 includes an MNA component as part of the remedy. Historical groundwater data suggest that reductive dichlorination processes are naturally occurring within OU1, and as the COCs naturally attenuate, a temporary increase of the types of compounds produced, some of which are toxic, will occur within the groundwater.

5. <u>Short-term Impacts and Effectiveness.</u> The potential short-term adverse impacts of the remedial

action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternatives 2 through 4 will have short-term impacts to remediation workers, the public, and the environment during implementation. All these alternatives implement monitoring to provide the data needed for proper management of the remedial processes and a mechanism to address any potential impacts to the community, remediation workers, and the environment.

Alternatives 5 and 6 will have the highest degree of short-term impacts compared to Alternatives 2 through 4. Alternative 5 activities that could impact the local community would be noise from drilling activities to install the heating/vacuum extraction wells and constructing the treatment system. Heating would need to be evaluated for short term impacts to sub-surface utilities or structures and the adjacent wetlands because the temperatures will reach 100 degrees C. Alternative 6 could impact the local community with noise from the excavation and increased truck traffic with the transportation and disposal of soil, and the delivery of backfill. There is the potential for airborne exposure, however, mitigation measures can be taken to address this potential.

RAOs are anticipated to be achieved with the shortest timeframe with Alternatives 5 and 6, followed by Alternatives 2, 3, and 4. Every alternative will rely on natural attenuation for the dissolved plume concentrations within and outside the treatment area. The heat generated during the ISTT is anticipated to enhance the natural attenuation of the plume outside the area of active remediation even after cessation of thermal operations, while Alternative 6 is anticipated to remove the most source material. It is anticipated that LTM will be performed for 11 years under Alternatives 5 and 6, 20 years for Alternatives 2 and 3, and 25 years for Alternative 4.

6. Implementability. The technical and administrative feasibility of implementing each alternative is evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

All six alternatives are implementable. Alternative 1 will be easiest both technically and administratively to implement as no additional work will be performed at OU1. Alternatives 2 through 4 and 6 will be technically implementable since services, materials and experienced vendors are readily available. Alternative 5 will be the most difficult to implement due to the limited number of qualified technology vendors and the large power requirements needed for ISTT. Various permit equivalences will be required for Alternatives 2 through 6.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

The costs of the alternatives range from $5.7 million for Alternative 6B – Source Area Excavation to Commercial SCOs and Off-site Disposal to $9.4 million for Alternative 5 – In-Situ Thermal Treatment Via Thermal Conductive Heating.

The costs of the alternatives do not vary significantly, except for Alternative 5. Time however does vary with Alternatives 2, 3, and 4 expected to achieve NYSDEC Class GA GWQS within 20 to 25 years and Alternatives 5 and 6, within 11 years. Alternative 6 has a high Capital Cost of $4.5 million (only exceeded by Alternative 5's Capital Cost of $8 million), however, it removes the greatest amount of source material in the shortest timeframe and is the most implementable.

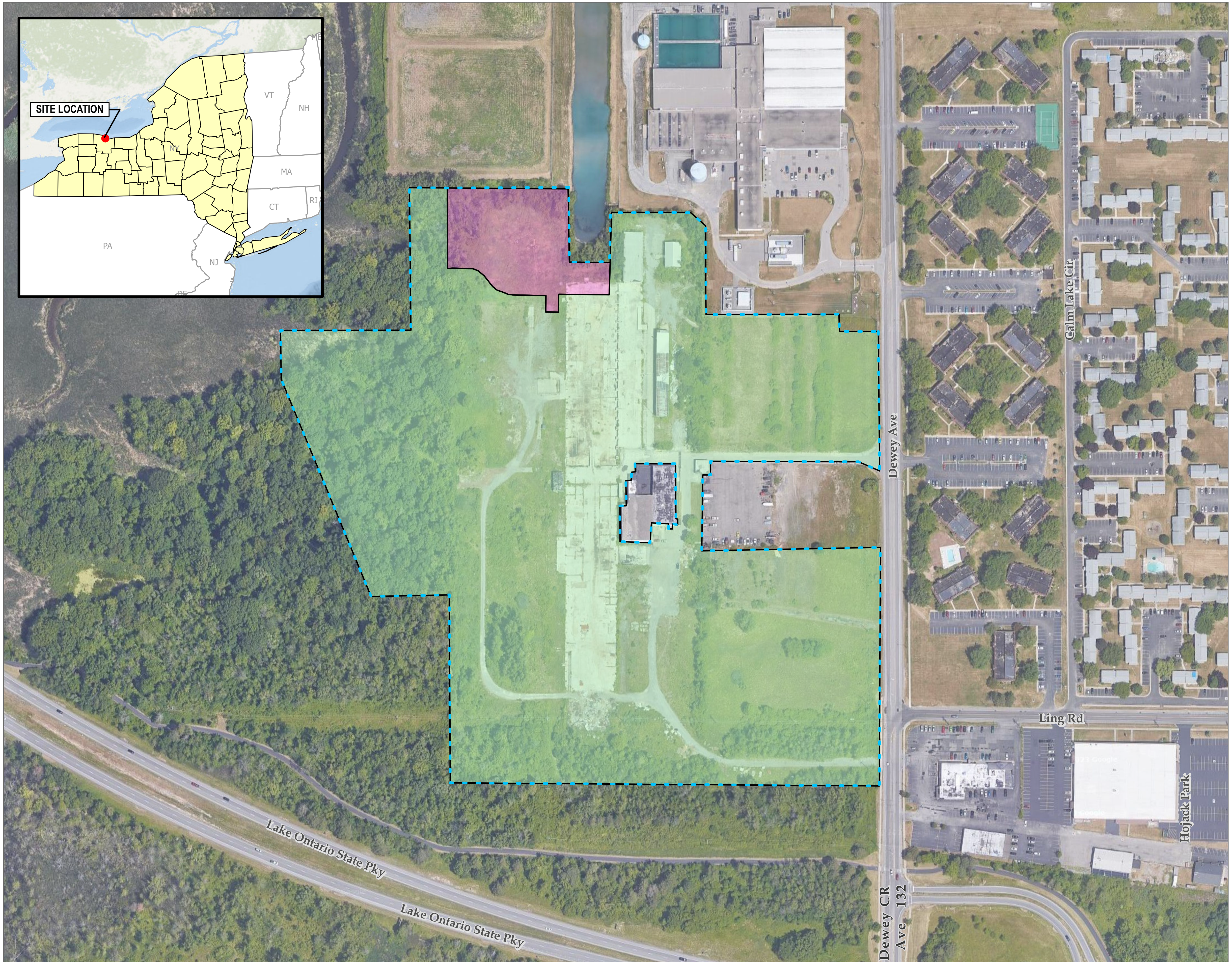
8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The area overlying the OU1 plume is zoned by the Town of Greece for flexible office/industrial use. Alternatives 2 through 6 will achieve Class GA GWQS within the active treatment area over time. Current zoning would limit land use to flexible office/industrial, so it is assumed that there would be no change in the current land use as a result of implementation of any of the alternatives.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the Department will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

Alternative #6A is being proposed because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.



LEGEND

- SITE BOUNDARY
- OU1 BOUNDARY
- OU2 BOUNDARY

BASE MAP: GOOGLE EARTH IMAGERY
SHEET SIZE: 11X17L

N

1" = 250'

0 125 250 FEET

PROJECT:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
FORMER AIR FORCE PLANT NO. 51 - SITE NO. 828156
4777 DEWEY AVENUE
GREECE, NEW YORK 14612

TITLE:

SITE LOCATION MAP

DRAWN BY:	L. LILL	PROJ. NO.:	481220.0000.0000
CHECKED BY:	J. ZIAYA	FIGURE 1	
APPROVED BY:	K. SULLIVAN		
DATE:	AUGUST 2023		

TRC

3 Corporate Drive
Suite 202
Clifton Park, NY 12065
Phone: 518.348.1190

FILE: PRAP.aprx

Coordinate System: NAD 1983 2011 StatePlane New York West FIPS 3103 Ft US; Map Rotation: 0
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LEGEND

- SITE BOUNDARY
- TAX PARCEL BOUNDARIES
- OU1 BOUNDARY
- OU2 BOUNDARY
- OU3 BOUNDARY

NOTES:

1. OU3 BOUNDARY INCLUDES PORTIONS OF THE STATE PARKWAY PROPERTY, LOT 046.01-1-3, AND LOT 035.03-1-7.

BASE MAP: GOOGLE EARTH IMAGERY
SHEET SIZE: 11X17L

N

1" = 300'

0 150 300 FEET

PROJECT:
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
FORMER AIR FORCE PLANT NO. 51 - SITE NO. 828156
4777 DEWEY AVENUE
GREECE, NEW YORK 14612

TITLE:
SITE PLAN AND OPERABLE UNITS

DRAWN BY:	L. LILL	PROJ. NO.:	481220.0000.0000
CHECKED BY:	J. ZIAYA	FIGURE 2	
APPROVED BY:	K. SULLIVAN		
DATE:	AUGUST 2023		

TRC
3 Corporate Drive
Suite 202
Clifton Park, NY 12065
Phone: 518.348.1190

FILE: PRAP.aprx

Coordinate System: NAD 1983 2011 StatePlane New York West FIPS 3103 Ft US; Map Rotation: -90
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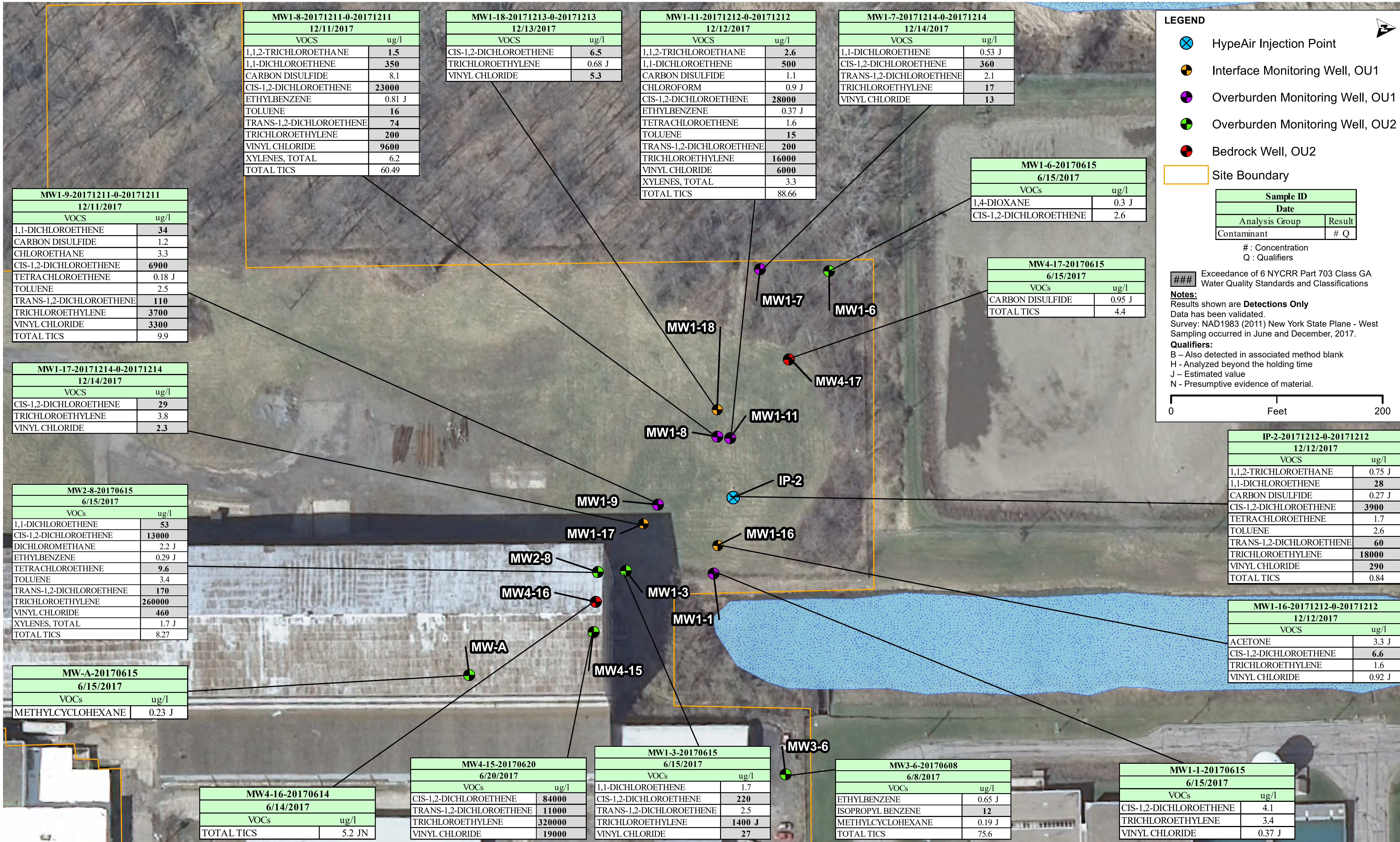


MW1-8-20171211-0-20171211	
12/11/2017	
VOCS	ug/l
1,1,2-TRICHLOROETHANE	**1.5**
1,1-DICHLOROETHENE	**350**
CARBON DISULFIDE	8.1
CIS-1,2-DICHLOROETHENE	**23000**
ETHYLBENZENE	0.81 J
TOLUENE	**16**
TRANS-1,2-DICHLOROETHENE	**74**
TRICHLOROETHYLENE	**200**
VINYL CHLORIDE	**9600**
XYLENES, TOTAL	6.2
TOTAL TICS	60.49

MW1-18-20171213-0-20171213	
12/13/2017	
VOCS	ug/l
CIS-1,2-DICHLOROETHENE	**6.5**
TRICHLOROETHYLENE	0.68 J
VINYL CHLORIDE	**5.3**

MW1-11-20171212-0-20171212	
12/12/2017	
VOCS	ug/l
1,1,2-TRICHLOROETHANE	**2.6**
1,1-DICHLOROETHENE	**500**
CARBON DISULFIDE	1.1
CHLOROFORM	0.9 J
CIS-1,2-DICHLOROETHENE	**28000**
ETHYLBENZENE	0.37 J
TETRACHLOROETHENE	1.6
TOLUENE	**15**
TRANS-1,2-DICHLOROETHENE	**200**
TRICHLOROETHYLENE	**16000**
VINYL CHLORIDE	**6000**
XYLENES, TOTAL	3.3
TOTAL TICS	88.66

MW1-7-20171214-0-20171214	
12/14/2017	
VOCS	ug/l
1,1-DICHLOROETHENE	0.53 J
CIS-1,2-DICHLOROETHENE	**360**
TRANS-1,2-DICHLOROETHENE	2.1
TRICHLOROETHYLENE	**17**
VINYL CHLORIDE	**13**

MW1-6-20170615	
6/15/2017	
VOCs	ug/l
1,4-DIOXANE	0.3 J
CIS-1,2-DICHLOROETHENE	2.6

MW4-17-20170615	
6/15/2017	
VOCs	ug/l
CARBON DISULFIDE	0.95 J
TOTAL TICS	4.4

MW1-9-20171211-0-20171211	
12/11/2017	
VOCS	ug/l
1,1-DICHLOROETHENE	**34**
CARBON DISULFIDE	1.2
CHLOROETHANE	3.3
CIS-1,2-DICHLOROETHENE	**6900**
TETRACHLOROETHENE	0.18 J
TOLUENE	2.5
TRANS-1,2-DICHLOROETHENE	**110**
TRICHLOROETHYLENE	**3700**
VINYL CHLORIDE	**3300**
TOTAL TICS	9.9

MW1-17-20171214-0-20171214	
12/14/2017	
VOCS	ug/l
CIS-1,2-DICHLOROETHENE	**29**
TRICHLOROETHYLENE	3.8
VINYL CHLORIDE	**2.3**

IP-2-20171212-0-20171212	
12/12/2017	
VOCS	ug/l
1,1,2-TRICHLOROETHANE	0.75 J
1,1-DICHLOROETHENE	**28**
CARBON DISULFIDE	0.27 J
CIS-1,2-DICHLOROETHENE	**3900**
TETRACHLOROETHENE	1.7
TOLUENE	2.6
TRANS-1,2-DICHLOROETHENE	**60**
TRICHLOROETHYLENE	**18000**
VINYL CHLORIDE	**290**
TOTAL TICS	0.84

MW2-8-20170615	
6/15/2017	
VOCs	ug/l
1,1-DICHLOROETHENE	**53**
CIS-1,2-DICHLOROETHENE	**13000**
DICHLOROMETHANE	2.2 J
ETHYLBENZENE	0.29 J
TETRACHLOROETHENE	**9.6**
TOLUENE	3.4
TRANS-1,2-DICHLOROETHENE	**170**
TRICHLOROETHYLENE	**260000**
VINYL CHLORIDE	**460**
XYLENES, TOTAL	1.7 J
TOTAL TICS	8.27

MW1-16-20171212-0-20171212	
12/12/2017	
VOCS	ug/l
ACETONE	3.3 J
CIS-1,2-DICHLOROETHENE	**6.6**
TRICHLOROETHYLENE	1.6
VINYL CHLORIDE	0.92 J

MW-A-20170615	
6/15/2017	
VOCs	ug/l
METHYLCYCLOHEXANE	0.23 J

MW4-16-20170614	
6/14/2017	
VOCs	ug/l
TOTAL TICS	5.2 JN

MW4-15-20170620	
6/20/2017	
VOCs	ug/l
CIS-1,2-DICHLOROETHENE	**84000**
TRANS-1,2-DICHLOROETHENE	**11000**
TRICHLOROETHYLENE	**320000**
VINYL CHLORIDE	**19000**

MW1-3-20170615	
6/15/2017	
VOCs	ug/l
1,1-DICHLOROETHENE	1.7
CIS-1,2-DICHLOROETHENE	**220**
TRANS-1,2-DICHLOROETHENE	2.5
TRICHLOROETHYLENE	**1400 J**
VINYL CHLORIDE	**27**

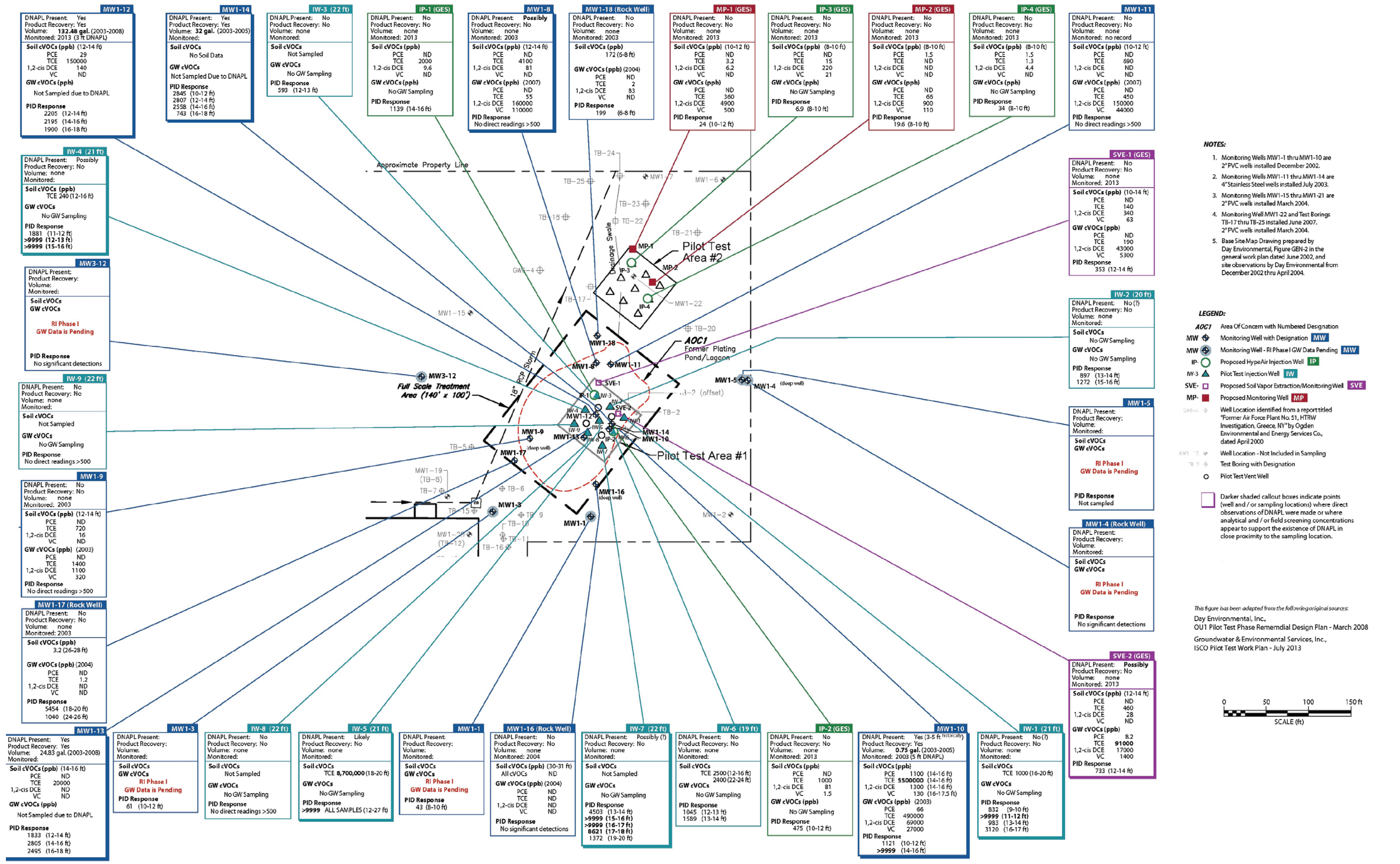
MW3-6-20170608	
6/8/2017	
VOCs	ug/l
ETHYLBENZENE	0.65 J
ISOPROPYL BENZENE	**12**
METHYLCYCLOHEXANE	0.19 J
TOTAL TICS	75.6

MW1-1-20170615	
6/15/2017	
VOCs	ug/l
CIS-1,2-DICHLOROETHENE	4.1
TRICHLOROETHYLENE	3.4
VINYL CHLORIDE	0.37 J

FORMER PLATING POND AREA GROUNDWATER SAMPLING RESULTS - VOCS

FORMER AIR FORCE PLANT NO. 51 (NYSDEC SITE # 828156)

FIGURE 3



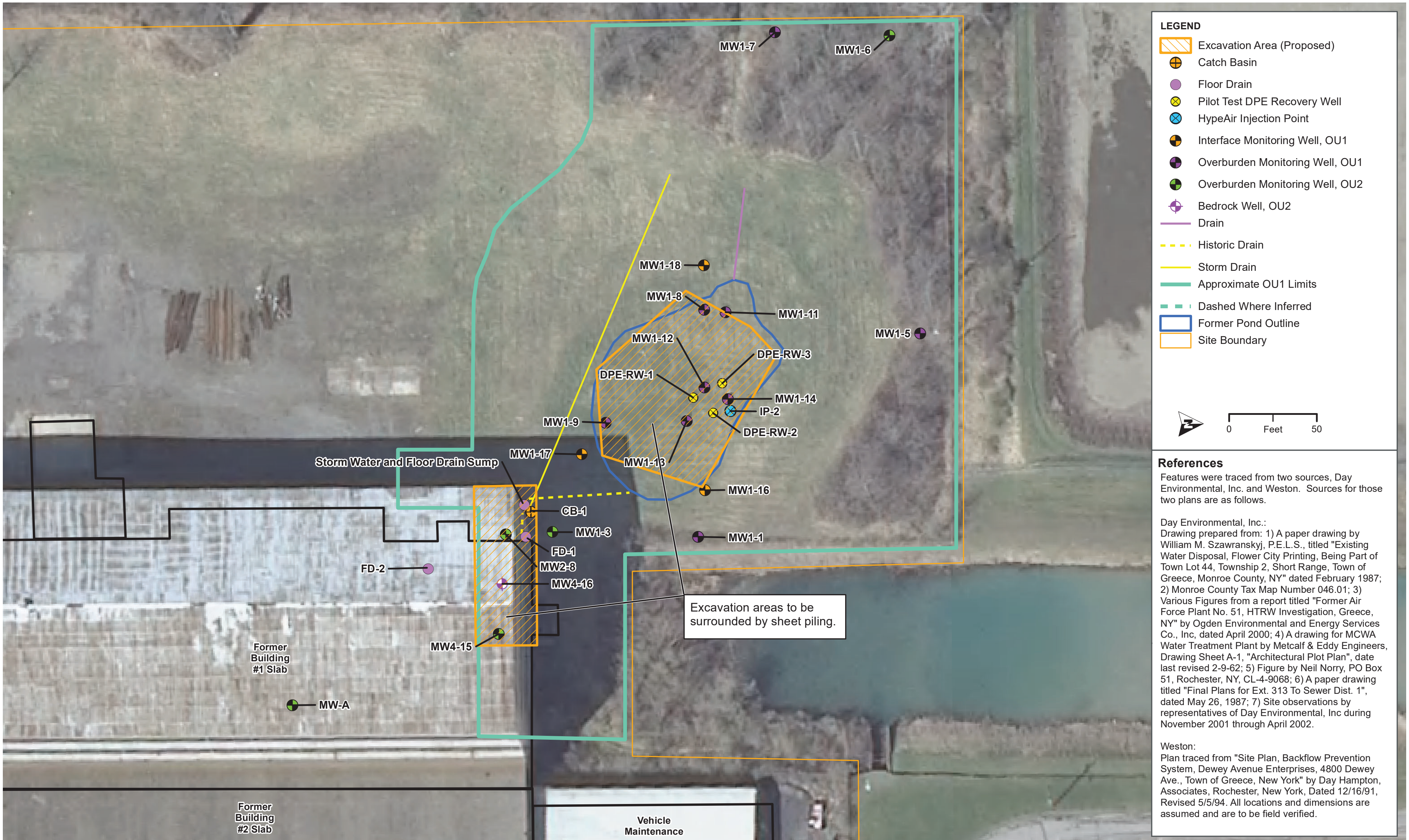
HDR

HISTORICAL GROUNDWATER SAMPLING RESULTS - 2013

FORMER AIR FORCE PLANT NO. 51 (NYSDEC SITE # 828156)

FIGURE 4

PATH: \\MAHPI-FILE01\GIS_PROJECTS\202315_NEW YORK STATE DEPT OF ENVIRONMENTAL CON\0202760_NYSDEC_MM_WA8_9_AFPLANT_RI-CM\GIS\MAP_DOCS\DRAFT\2017 SITE-WIDE GROUNDWATER SAMPLING\GROUNDWATER CHEM RESULTS - DECEMBER\FIG5_HISTORICALGROUNDWATERSAMPLINGRESULTS-2013.MXD - USER: HROSADO - DATE: 10/10/2018



References

Features were traced from two sources, Day Environmental, Inc. and Weston. Sources for those two plans are as follows.

Day Environmental, Inc.:
Drawing prepared from: 1) A paper drawing by William M. Szawranskyj, P.E.L.S., titled "Existing Water Disposal, Flower City Printing, Being Part of Town Lot 44, Township 2, Short Range, Town of Greece, Monroe County, NY" dated February 1987; 2) Monroe County Tax Map Number 046.01; 3) Various Figures from a report titled "Former Air Force Plant No. 51, HTRW Investigation, Greece, NY" by Ogden Environmental and Energy Services Co., Inc, dated April 2000; 4) A drawing for MCWA Water Treatment Plant by Metcalf & Eddy Engineers, Drawing Sheet A-1, "Architectural Plot Plan", date last revised 2-9-62; 5) Figure by Neil Norry, PO Box 51, Rochester, NY, CL-4-9068; 6) A paper drawing titled "Final Plans for Ext. 313 To Sewer Dist. 1", dated May 26, 1987; 7) Site observations by representatives of Day Environmental, Inc during November 2001 through April 2002.

Weston:
Plan traced from "Site Plan, Backflow Prevention System, Dewey Avenue Enterprises, 4800 Dewey Ave., Town of Greece, New York" by Day Hampton, Associates, Rochester, New York, Dated 12/16/91, Revised 5/5/94. All locations and dimensions are assumed and are to be field verified.

HDR

ALTERNATIVE 6 - EXCAVATION AND OFFSITE DISPOSAL

FORMER AIR FORCE PLANT NO, 51 (NYSDEC SITE # 828156)

FIGURE 5

ATTACHMENT 1

SEFA ANALYSIS OUTPUT – ALTERNATIVE 2

DUAL-PHASE EXTRACTION FOR SOURCE AREA AND IN-SITU BIOREMEDIATION

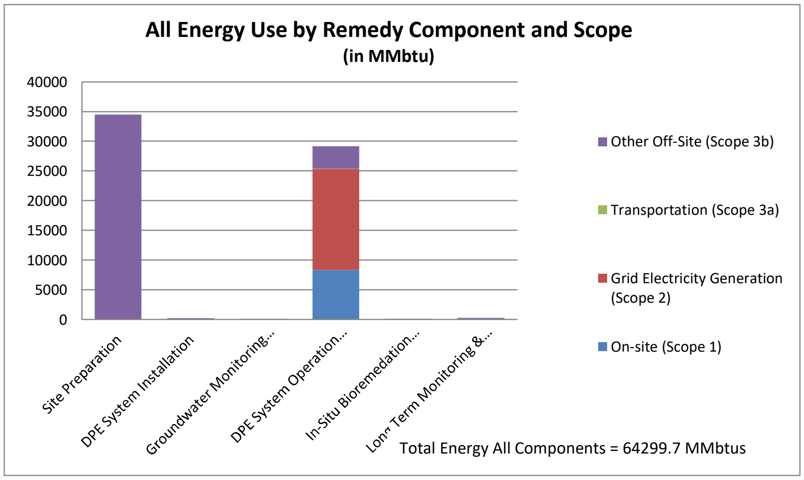
Environmental Footprint Summary

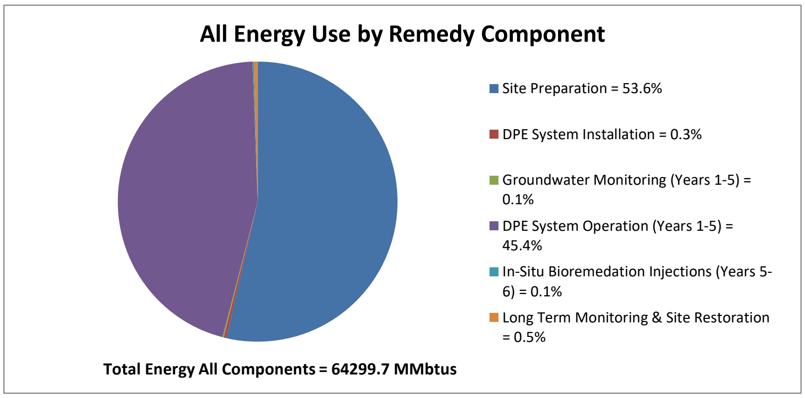
Core Element	Metric		Unit of Measure	Footprint: Site Preparation	DPE System Installation	Groundwater Monitoring (Years 1-5)	DPE System Operation (Years 1-5)	In-Situ Bioremedation Injections (Years 5-6)	Long Term Monitoring & Site Restoration	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	126.6	4.9	0.8	5.0	213.3	1.9	352.6
	M&W-2	% of refined materials from recycled or reused material	%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	1.4%
	M&W-3	Unrefined materials used on-site	Tons	204.3	0.7	0.0	0.0	0.0	0.0	204.9
	M&W-4	% of unrefined materials from recycled or reused material	%	0.0%	0.0%					0.0%
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	0.9	0.0	0.0	0.0	67.0	67.9
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%		0.0%				0.0%	0.0%
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.7	0.0	0.7
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	34,470.5	196.3	82.2	29,167.1	90.3	293.2	64,299.7
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.0	0.4	0.0	2,450.6	0.0	0.0	2,451.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	49.1	86.0	0.0	1.8	91.5	64.4	292.9
	A-2	On-site HAP emissions	Pounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	9,681.5	546.7	144.8	12,082.5	122.9	494.3	23,072.7
	A-3A	Total NOx emissions	Pounds	2,451.9	260.4	43.8	4,524.7	99.2	200.1	7,580.0
	A-3B	Total SOx emissions	Pounds	6,547.3	276.8	88.1	7,334.1	10.1	232.1	14,488.5
	A-3C	Total PM emissions	Pounds	682.2	9.4	13.0	223.7	13.5	62.1	1,004.1
	A-4	Total HAP emissions	Pounds	820.9	2.6	8.8	131.8	0.7	23.0	987.8
	A-5	Total greenhouse gas emissions	Tons CO2e*	450.1	16.0	3.4	551.1	163.9	15.6	1,200.1
Land & Ecosystems		Qualitative Description								

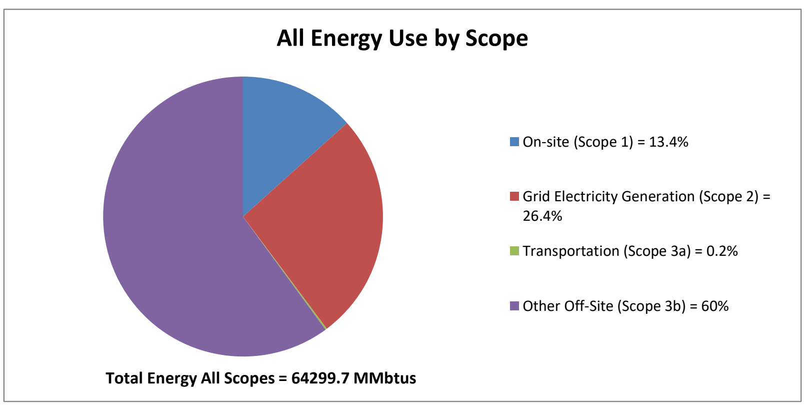
**Total greenhouse gases emissions (in CO2e) include CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)
"HAP" = hazardous air pollutants
"PM" = particulate matter
"NOx" = nitgroen oxides
"SOx" = sulfur oxides
"CO2" = carbon dioxide
"CH4" = methane
"N2O" = nitrous oxide

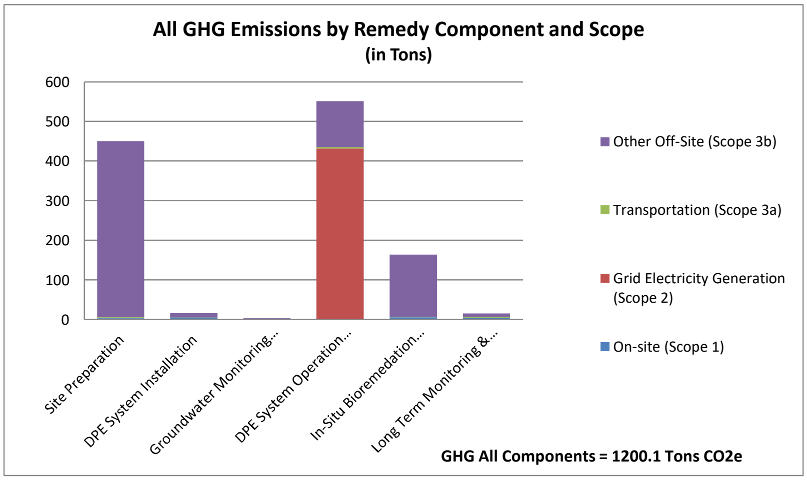
The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

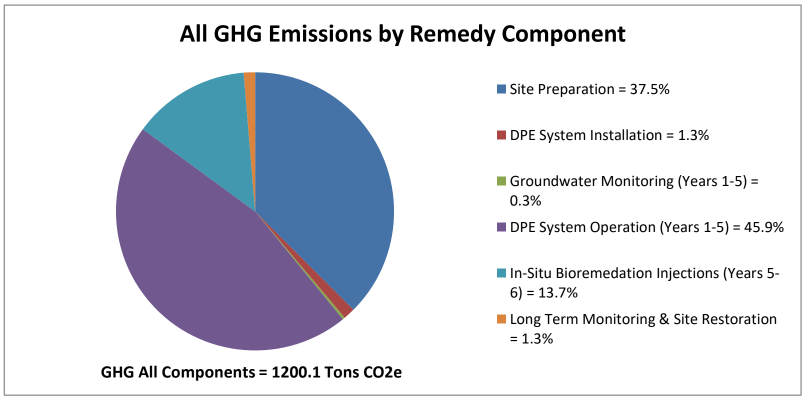
Notes:

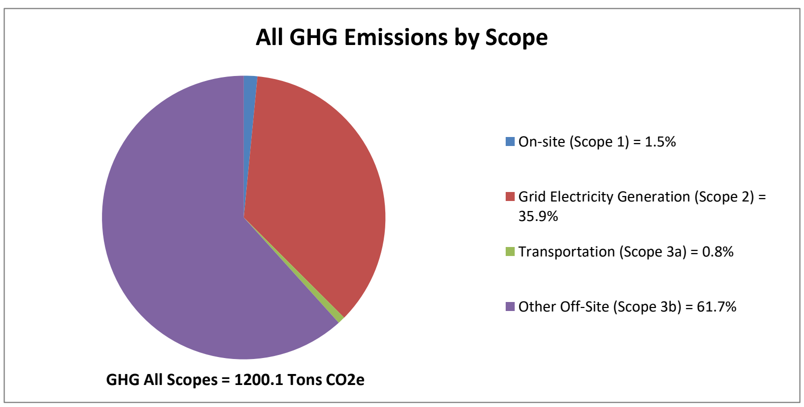

All Energy Use by Remedy Component and Scope
(in MMbtu)
40000
35000
30000
25000
20000
15000
10000
5000
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Bioremediation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 64299.7 MMbtus

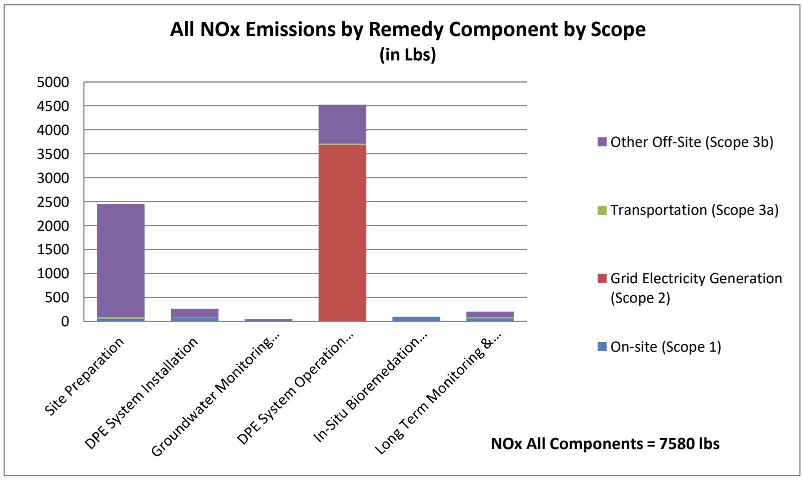

All Energy Use by Remedy Component
Site Preparation = 53.6%
DPE System Installation = 0.3%
Groundwater Monitoring (Years 1-5) = 0.1%
DPE System Operation (Years 1-5) = 45.4%
In-Situ Bioremediation Injections (Years 5-6) = 0.1%
Long Term Monitoring & Site Restoration = 0.5%
Total Energy All Components = 64299.7 MMbtus

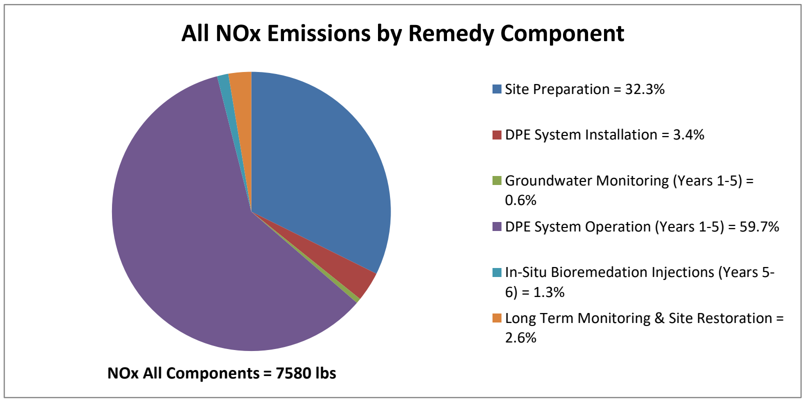

All Energy Use by Scope
On-site (Scope 1) = 13.4%
Grid Electricity Generation (Scope 2) = 26.4%
Transportation (Scope 3a) = 0.2%
Other Off-Site (Scope 3b) = 60%
Total Energy All Scopes = 64299.7 MMbtus

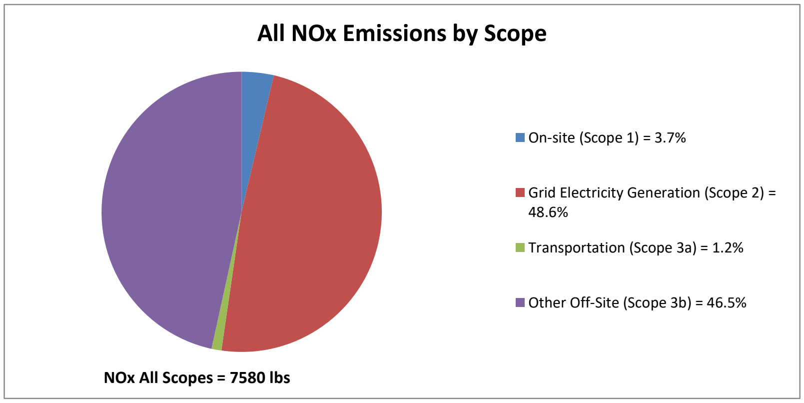

All GHG Emissions by Remedy Component and Scope
(in Tons)
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Bioremedation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 1200.1 Tons CO2e


All GHG Emissions by Remedy Component
Site Preparation = 37.5%
DPE System Installation = 1.3%
Groundwater Monitoring (Years 1-5) = 0.3%
DPE System Operation (Years 1-5) = 45.9%
In-Situ Bioremedation Injections (Years 5-6) = 13.7%
Long Term Monitoring & Site Restoration = 1.3%
GHG All Components = 1200.1 Tons CO2e

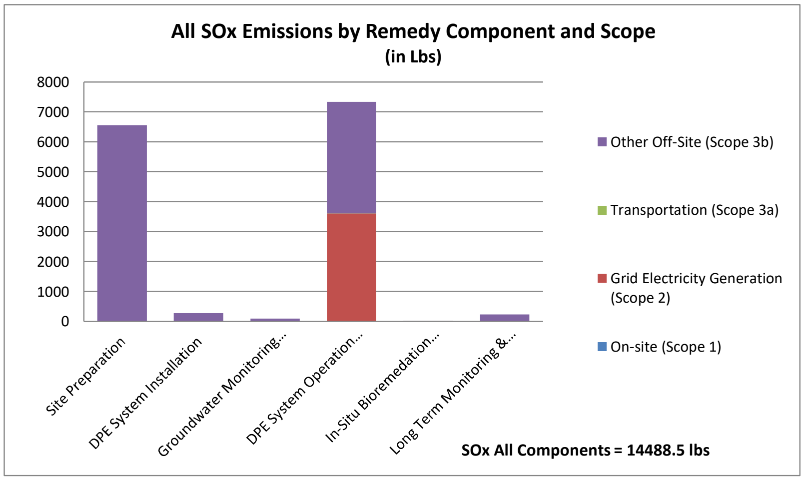

All GHG Emissions by Scope
On-site (Scope 1) = 1.5%
Grid Electricity Generation (Scope 2) = 35.9%
Transportation (Scope 3a) = 0.8%
Other Off-Site (Scope 3b) = 61.7%
GHG All Scopes = 1200.1 Tons CO2e

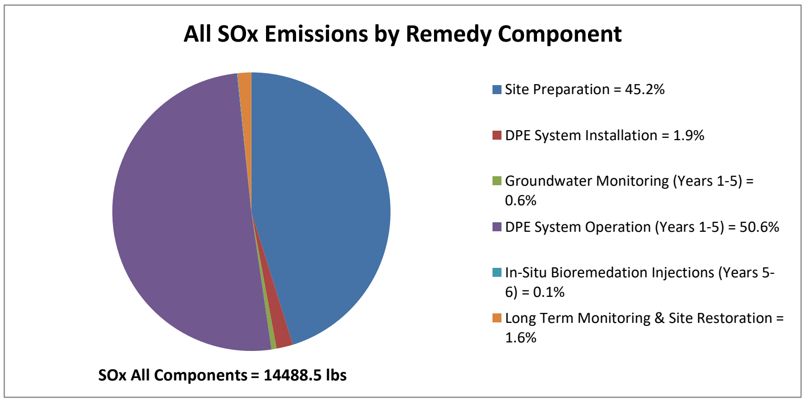

All NOx Emissions by Remedy Component by Scope
(in Lbs)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Bioremediation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 7580 lbs

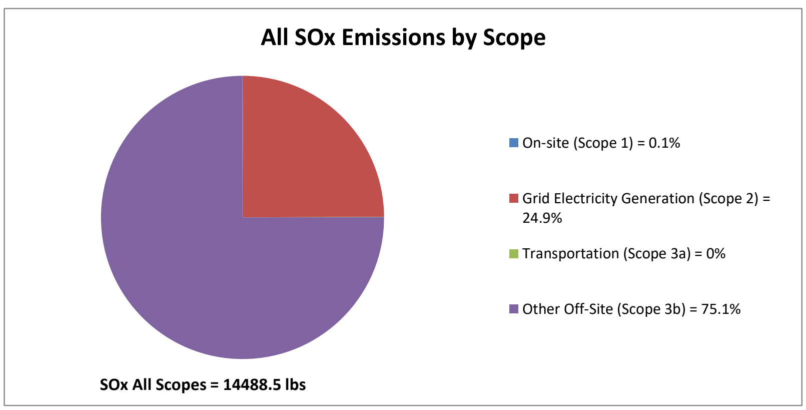

All NOx Emissions by Remedy Component
Site Preparation = 32.3%
DPE System Installation = 3.4%
Groundwater Monitoring (Years 1-5) = 0.6%
DPE System Operation (Years 1-5) = 59.7%
In-Situ Bioremediation Injections (Years 5-6) = 1.3%
Long Term Monitoring & Site Restoration = 2.6%
NOx All Components = 7580 lbs

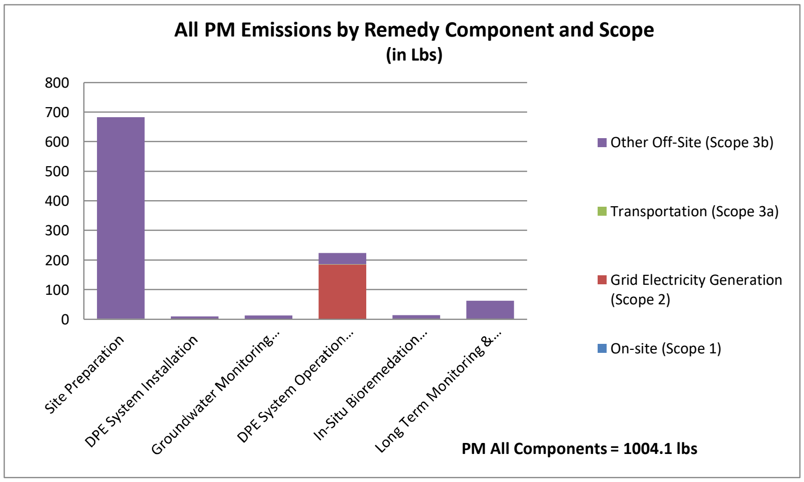

All NOx Emissions by Scope
On-site (Scope 1) = 3.7%
Grid Electricity Generation (Scope 2) = 48.6%
Transportation (Scope 3a) = 1.2%
Other Off-Site (Scope 3b) = 46.5%
NOx All Scopes = 7580 lbs

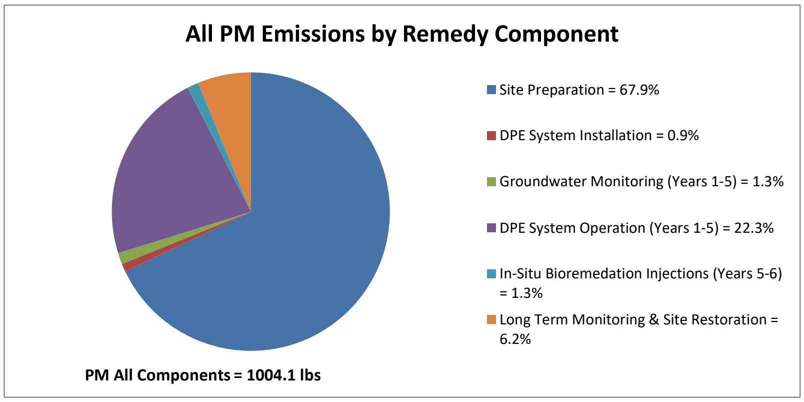
TRC

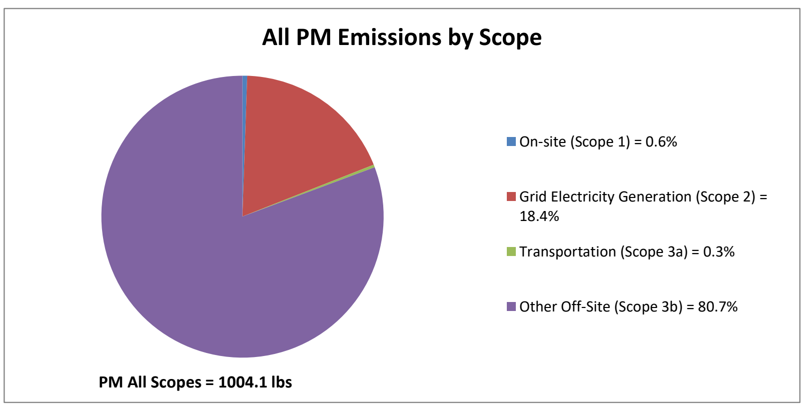

All SOx Emissions by Remedy Component and Scope
(in Lbs)
8000
7000
6000
5000
4000
3000
2000
1000
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Bioremedation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 14488.5 lbs

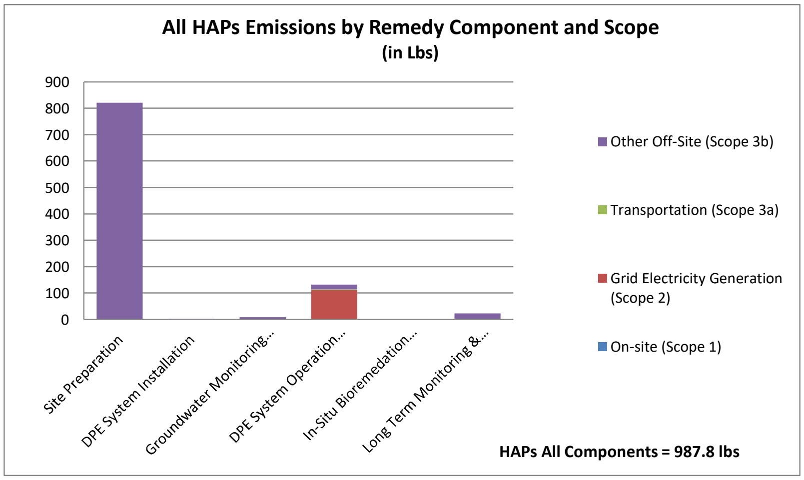

All SOx Emissions by Remedy Component
Site Preparation = 45.2%
DPE System Installation = 1.9%
Groundwater Monitoring (Years 1-5) = 0.6%
DPE System Operation (Years 1-5) = 50.6%
In-Situ Bioremedation Injections (Years 5-6) = 0.1%
Long Term Monitoring & Site Restoration = 1.6%
SOx All Components = 14488.5 lbs

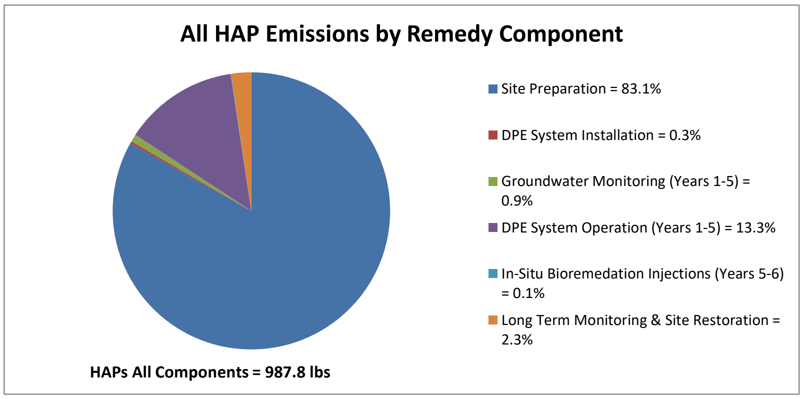

All SOx Emissions by Scope
On-site (Scope 1) = 0.1%
Grid Electricity Generation (Scope 2) = 24.9%
Transportation (Scope 3a) = 0%
Other Off-Site (Scope 3b) = 75.1%
SOx All Scopes = 14488.5 lbs

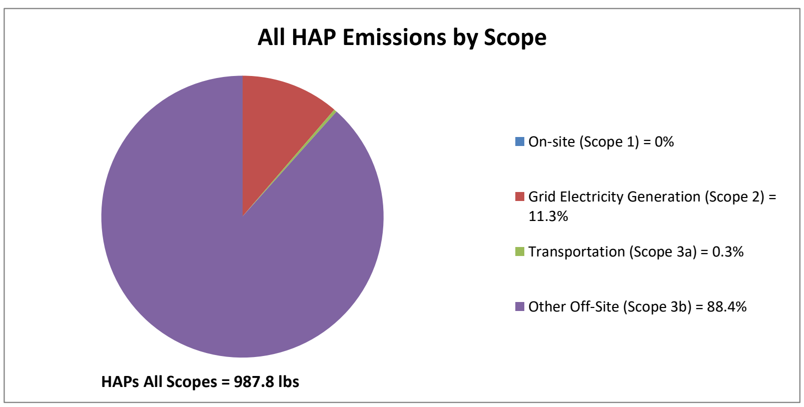

All PM Emissions by Remedy Component and Scope
(in Lbs)
800
700
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Bioremedation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 1004.1 lbs


All PM Emissions by Remedy Component
Site Preparation = 67.9%
DPE System Installation = 0.9%
Groundwater Monitoring (Years 1-5) = 1.3%
DPE System Operation (Years 1-5) = 22.3%
In-Situ Bioremedation Injections (Years 5-6) = 1.3%
Long Term Monitoring & Site Restoration = 6.2%
PM All Components = 1004.1 lbs


All PM Emissions by Scope
On-site (Scope 1) = 0.6%
Grid Electricity Generation (Scope 2) = 18.4%
Transportation (Scope 3a) = 0.3%
Other Off-Site (Scope 3b) = 80.7%
PM All Scopes = 1004.1 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
900
800
700
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Bioremedation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 987.8 lbs


All HAP Emissions by Remedy Component
Site Preparation = 83.1%
DPE System Installation = 0.3%
Groundwater Monitoring (Years 1-5) = 0.9%
DPE System Operation (Years 1-5) = 13.3%
In-Situ Bioremedation Injections (Years 5-6) = 0.1%
Long Term Monitoring & Site Restoration = 2.3%
HAPs All Components = 987.8 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 11.3%
Transportation (Scope 3a) = 0.3%
Other Off-Site (Scope 3b) = 88.4%
HAPs All Scopes = 987.8 lbs

ATTACHMENT 2

SEFA ANALYSIS OUTPUT – ALTERNATIVE 3

DUAL-PHASE EXTRACTION FOR SOURCE AREA AND IN-SITU CHEMICAL OXIDATION

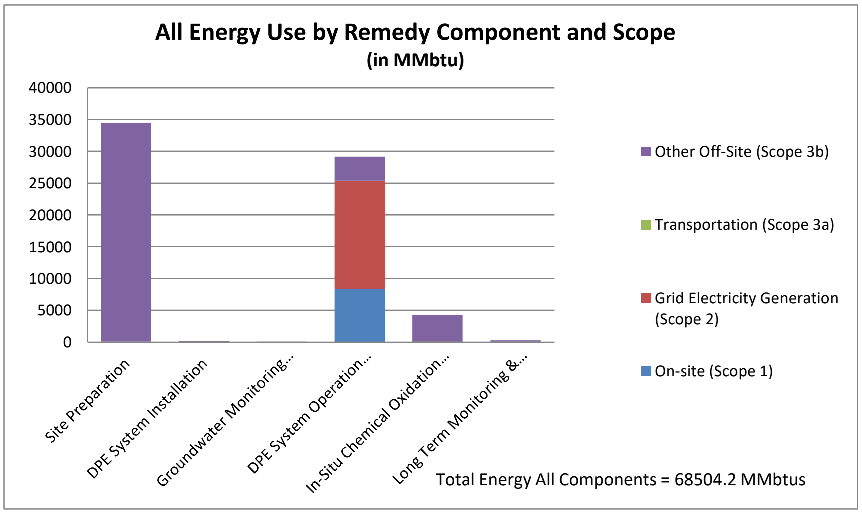
Environmental Footprint Summary

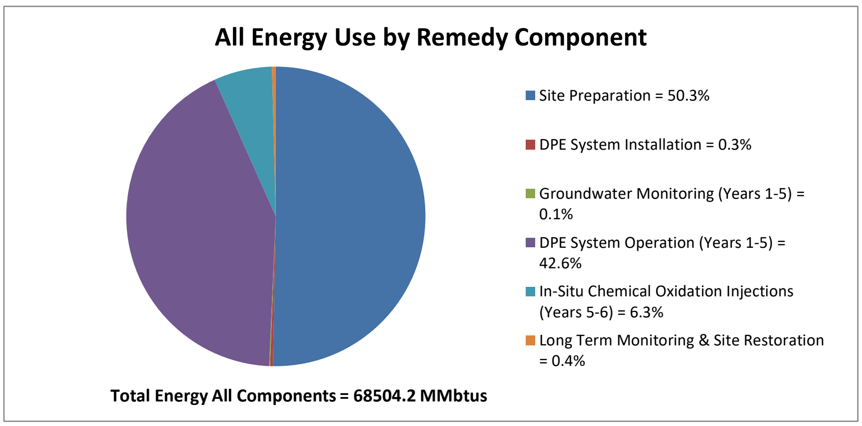
Core Element	Metric		Unit of Measure	Footprint						
				Site Preparation	DPE System Installation	Groundwater Monitoring (Years 1-5)	DPE System Operation (Years 1-5)	In-Situ Chemical Oxidation Injections (Years 5-6)	Long Term Monitoring & Site Restoration	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	126.6	4.9	0.8	5.0	213.3	1.9	352.6
	M&W-2	% of refined materials from recycled or reused material	%	0.0	0.0	0.0	1.0	0.0	0.0	0.0
	M&W-3	Unrefined materials used on-site	Tons	204.3	0.7	0.0	0.0	0.0	0.0	204.9
	M&W-4	% of unrefined materials from recycled or reused material	%	0.0	0.0					0.0
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	0.9	0.0	0.0	0.0	67.0	67.9
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%		0.0				0.0	0.0
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.7	0.0	0.7
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	34,470.5	196.4	82.2	29,165.6	4,296.3	293.2	68,504.2
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.0	0.4	0.0	2,450.6	0.0	0.0	2,451.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	49.1	86.0	0.0	0.1	114.4	64.4	314.1
	A-2	On-site HAP emissions	Pounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	9,681.5	546.7	144.8	12,080.7	2,691.3	494.3	25,639.3
	A-3A	Total NOx emissions	Pounds	2,451.9	260.4	43.8	4,523.0	1,120.1	200.1	8,599.3
	A-3B	Total SOx emissions	Pounds	6,547.3	276.8	88.1	7,334.0	1,377.0	232.1	15,855.3
	A-3C	Total PM emissions	Pounds	682.2	9.4	13.0	223.7	194.3	62.1	1,184.7
	A-4	Total HAP emissions	Pounds	820.9	2.6	8.8	131.8	52.9	23.0	1,040.0
	A-5	Total greenhouse gas emissions	Tons CO2e*	450.1	16.0	3.4	550.9	257.7	15.6	1,293.8
Land & Ecosystems		Qualitative Description								

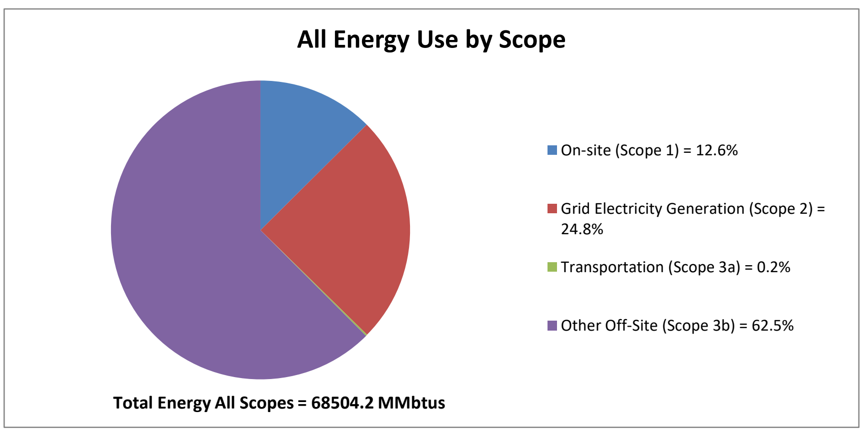
**Total greenhouse gases emissions (in CO2e) include CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)
"HAP" = hazardous air pollutants
"PM" = particulate matter
"NOx" = nitgroen oxides
"SOx" = sulfur oxides
"CO2" = carbon dioxide
"CH4" = methane
"N2O" = nitrous oxide

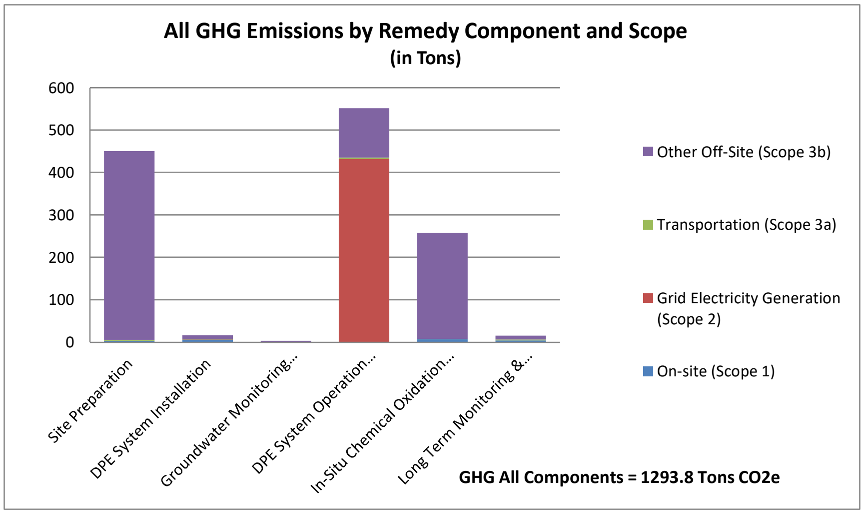
The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

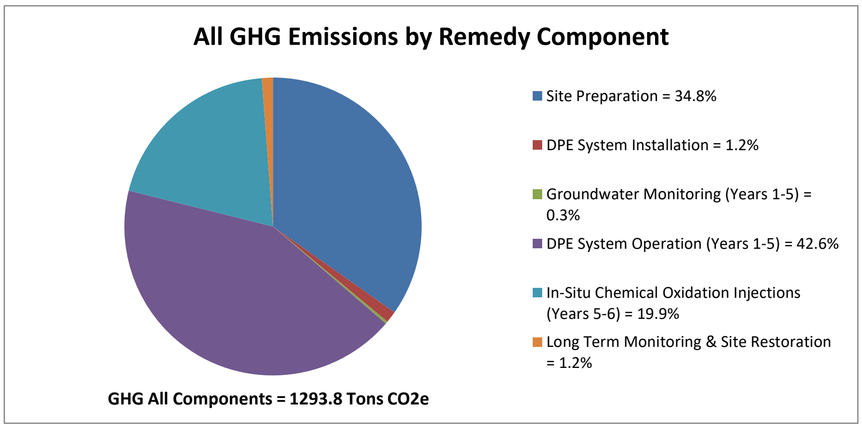
Notes:

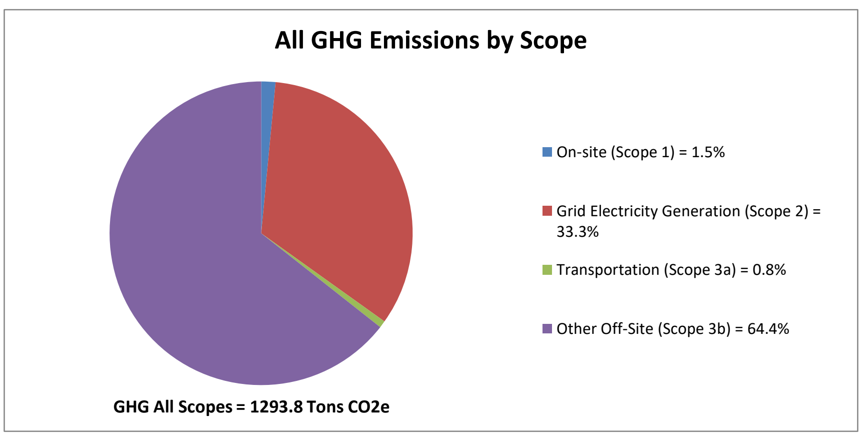

All Energy Use by Remedy Component and Scope
(in MMbtu)
40000
35000
30000
25000
20000
15000
10000
5000
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Chemical Oxidation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 68504.2 MMbtus

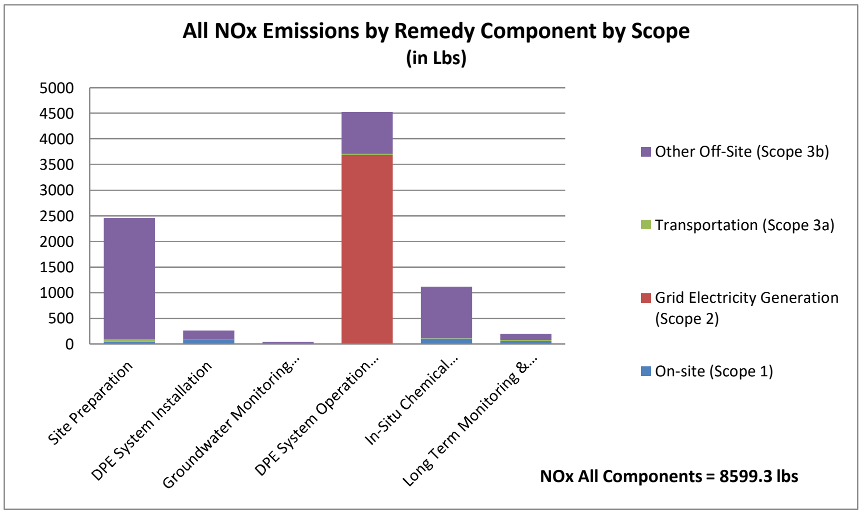

All Energy Use by Remedy Component
Site Preparation = 50.3%
DPE System Installation = 0.3%
Groundwater Monitoring (Years 1-5) = 0.1%
DPE System Operation (Years 1-5) = 42.6%
In-Situ Chemical Oxidation Injections (Years 5-6) = 6.3%
Long Term Monitoring & Site Restoration = 0.4%
Total Energy All Components = 68504.2 MMbtus

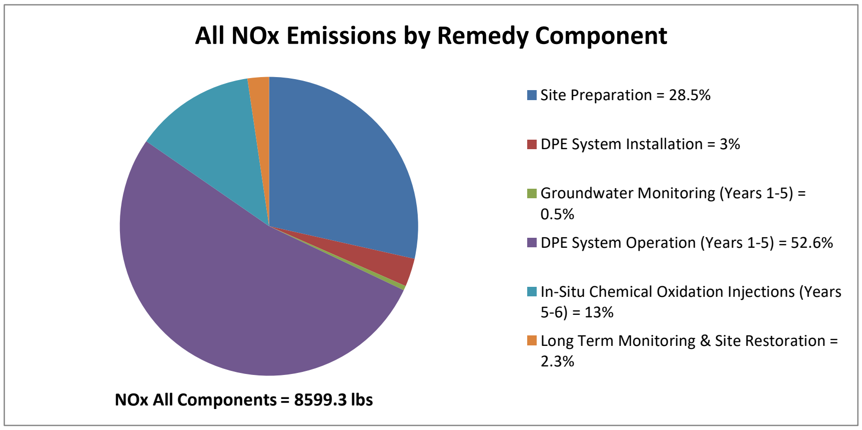

All Energy Use by Scope
On-site (Scope 1) = 12.6%
Grid Electricity Generation (Scope 2) = 24.8%
Transportation (Scope 3a) = 0.2%
Other Off-Site (Scope 3b) = 62.5%
Total Energy All Scopes = 68504.2 MMbtus

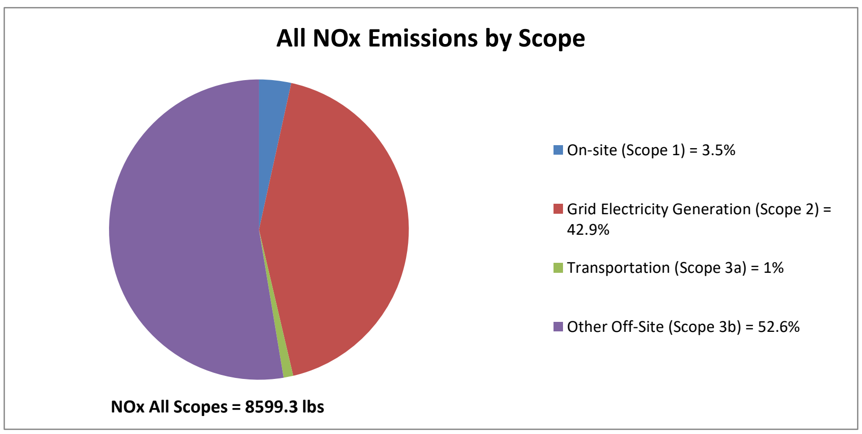

All GHG Emissions by Remedy Component and Scope
(in Tons)
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Chemical Oxidation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 1293.8 Tons CO2e

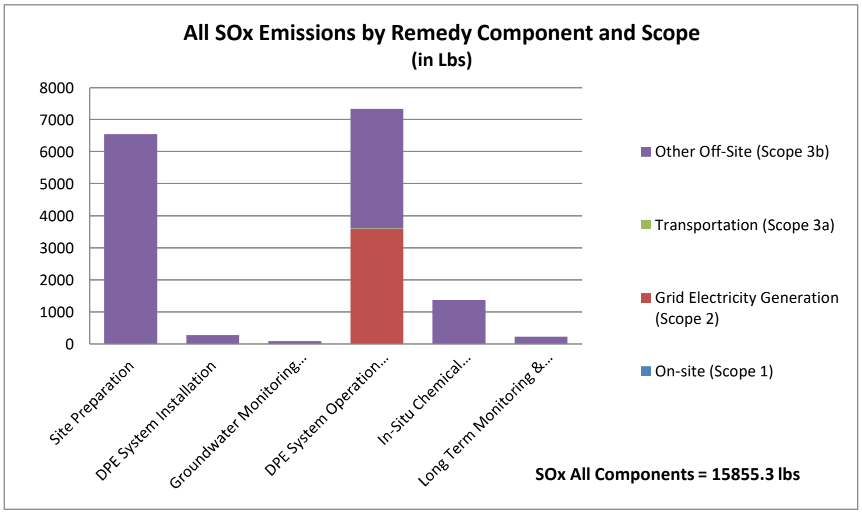

All GHG Emissions by Remedy Component
Site Preparation = 34.8%
DPE System Installation = 1.2%
Groundwater Monitoring (Years 1-5) = 0.3%
DPE System Operation (Years 1-5) = 42.6%
In-Situ Chemical Oxidation Injections (Years 5-6) = 19.9%
Long Term Monitoring & Site Restoration = 1.2%
GHG All Components = 1293.8 Tons CO2e

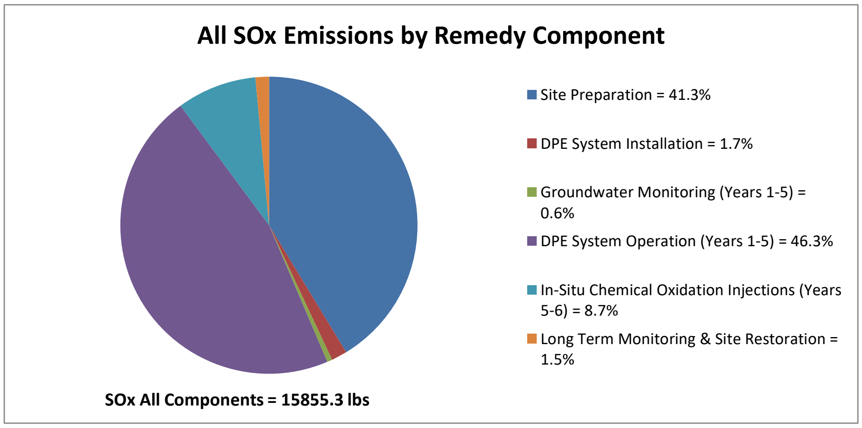

All GHG Emissions by Scope
On-site (Scope 1) = 1.5%
Grid Electricity Generation (Scope 2) = 33.3%
Transportation (Scope 3a) = 0.8%
Other Off-Site (Scope 3b) = 64.4%
GHG All Scopes = 1293.8 Tons CO2e

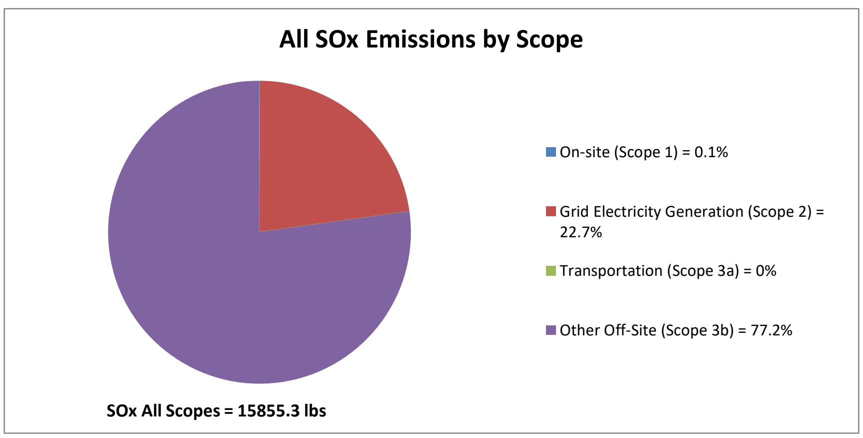

All NOx Emissions by Remedy Component by Scope
(in Lbs)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Chemical...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 8599.3 lbs

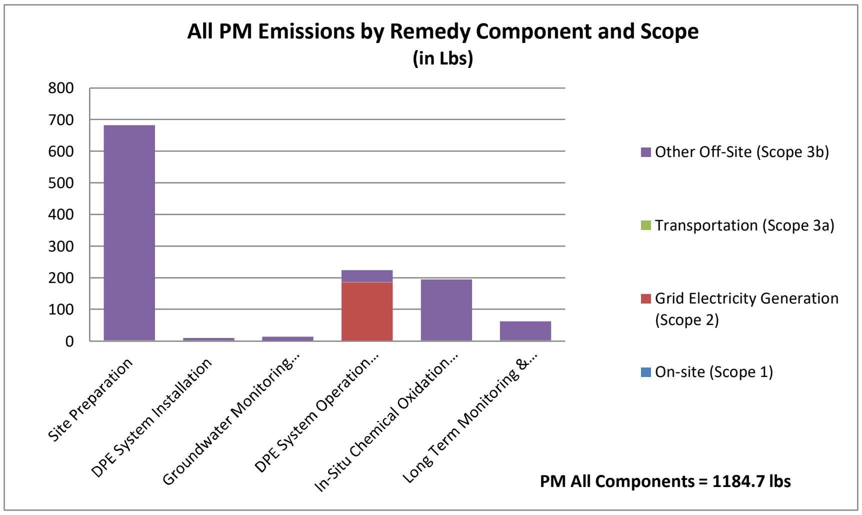

All NOx Emissions by Remedy Component
Site Preparation = 28.5%
DPE System Installation = 3%
Groundwater Monitoring (Years 1-5) = 0.5%
DPE System Operation (Years 1-5) = 52.6%
In-Situ Chemical Oxidation Injections (Years 5-6) = 13%
Long Term Monitoring & Site Restoration = 2.3%
NOx All Components = 8599.3 lbs

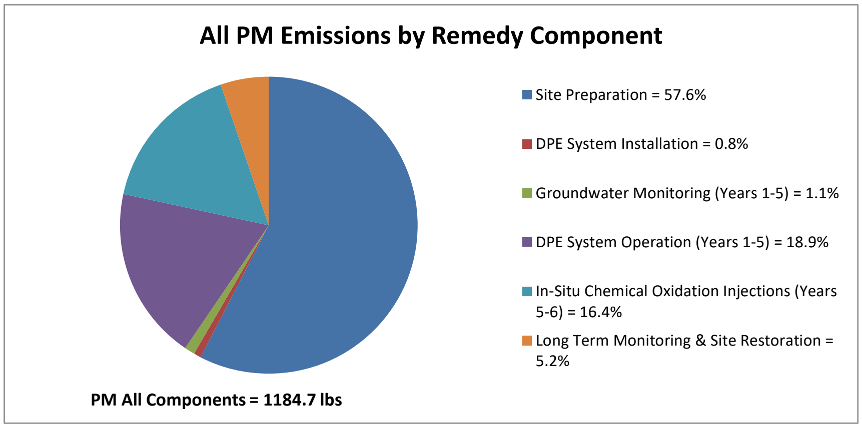

All NOx Emissions by Scope
On-site (Scope 1) = 3.5%
Grid Electricity Generation (Scope 2) = 42.9%
Transportation (Scope 3a) = 1%
Other Off-Site (Scope 3b) = 52.6%
NOx All Scopes = 8599.3 lbs

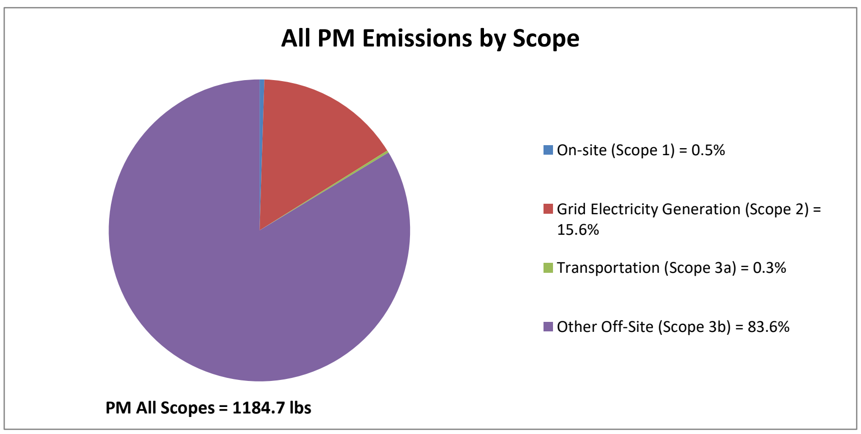

All SOx Emissions by Remedy Component and Scope
(in Lbs)
8000
7000
6000
5000
4000
3000
2000
1000
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Chemical...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 15855.3 lbs

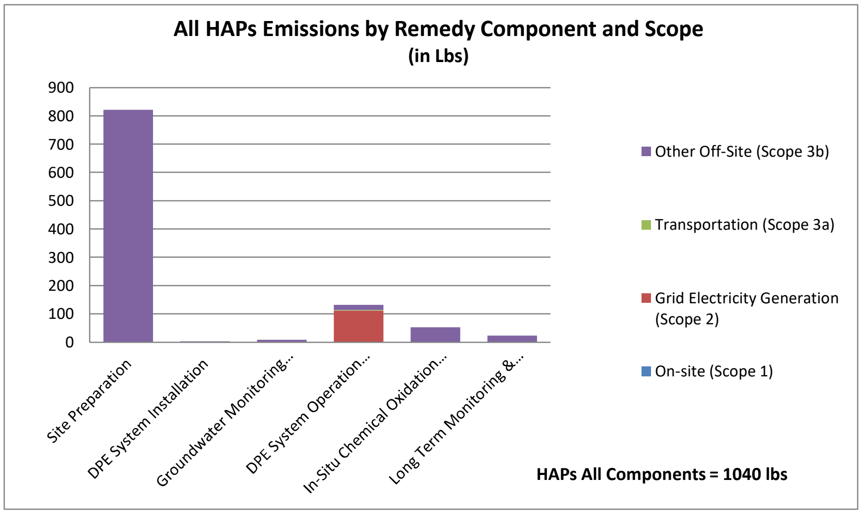

All SOx Emissions by Remedy Component
Site Preparation = 41.3%
DPE System Installation = 1.7%
Groundwater Monitoring (Years 1-5) = 0.6%
DPE System Operation (Years 1-5) = 46.3%
In-Situ Chemical Oxidation Injections (Years 5-6) = 8.7%
Long Term Monitoring & Site Restoration = 1.5%
SOx All Components = 15855.3 lbs

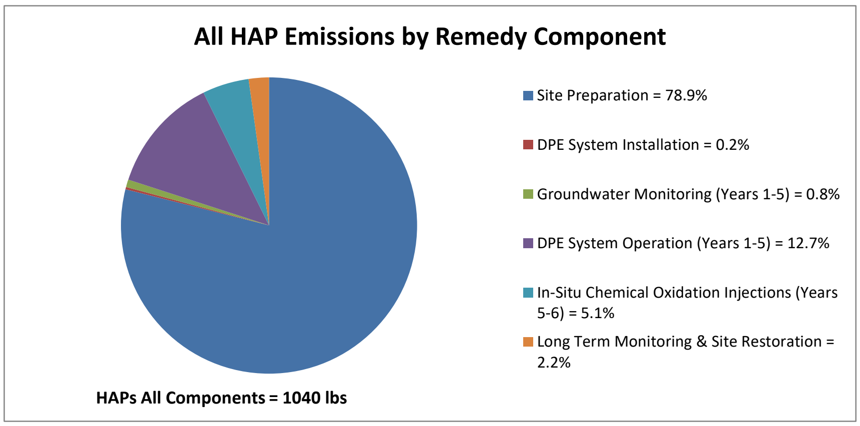

All SOx Emissions by Scope
On-site (Scope 1) = 0.1%
Grid Electricity Generation (Scope 2) = 22.7%
Transportation (Scope 3a) = 0%
Other Off-Site (Scope 3b) = 77.2%
SOx All Scopes = 15855.3 lbs

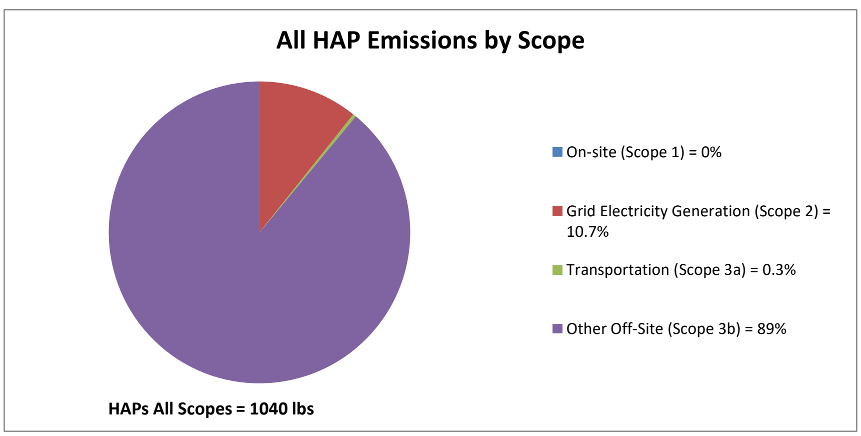

All PM Emissions by Remedy Component and Scope
(in Lbs)
800
700
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Chemical Oxidation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 1184.7 lbs


All PM Emissions by Remedy Component
Site Preparation = 57.6%
DPE System Installation = 0.8%
Groundwater Monitoring (Years 1-5) = 1.1%
DPE System Operation (Years 1-5) = 18.9%
In-Situ Chemical Oxidation Injections (Years 5-6) = 16.4%
Long Term Monitoring & Site Restoration = 5.2%
PM All Components = 1184.7 lbs


All PM Emissions by Scope
On-site (Scope 1) = 0.5%
Grid Electricity Generation (Scope 2) = 15.6%
Transportation (Scope 3a) = 0.3%
Other Off-Site (Scope 3b) = 83.6%
PM All Scopes = 1184.7 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
900
800
700
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Groundwater Monitoring...
DPE System Operation...
In-Situ Chemical Oxidation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 1040 lbs


All HAP Emissions by Remedy Component
Site Preparation = 78.9%
DPE System Installation = 0.2%
Groundwater Monitoring (Years 1-5) = 0.8%
DPE System Operation (Years 1-5) = 12.7%
In-Situ Chemical Oxidation Injections (Years 5-6) = 5.1%
Long Term Monitoring & Site Restoration = 2.2%
HAPs All Components = 1040 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 10.7%
Transportation (Scope 3a) = 0.3%
Other Off-Site (Scope 3b) = 89%
HAPs All Scopes = 1040 lbs

ATTACHMENT 3

SEFA ANALYSIS OUTPUT – ALTERNATIVE 4

DUAL-PHASE EXTRACTION FOR SOURCE AREA AND PERMEABLE REACTIVE BARRIER

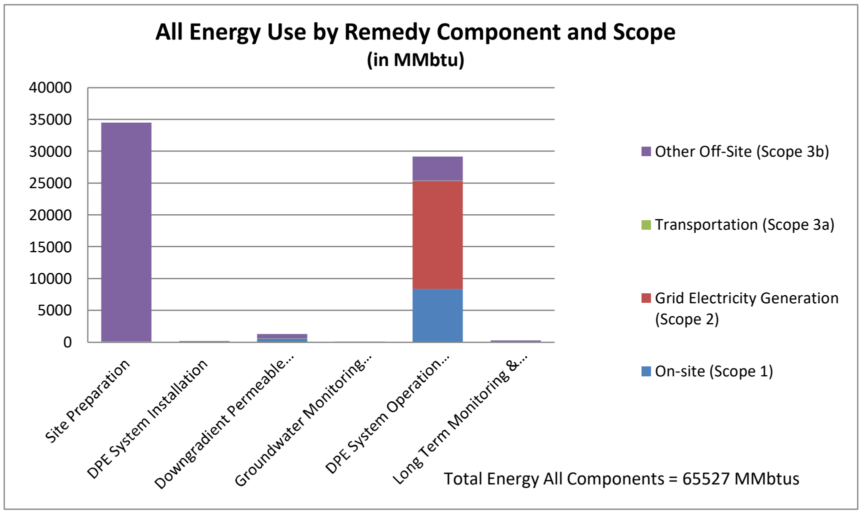
Environmental Footprint Summary

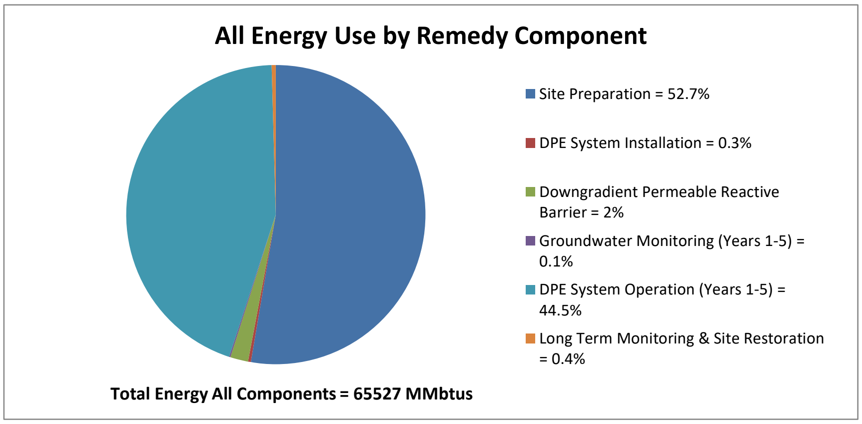
Core Element	Metric		Unit of Measure	Footprint						
				Site Preparation	**DPE System Installation**	**Downgradient Permeable Reactive Barrier**	**Groundwater Monitoring (Years 1-5)**	**DPE System Operation (Years 1-5)**	**Long Term Monitoring & Site Restoration**	**Total**
Materials & Waste	M&W-1	Refined materials used on-site	Tons	126.6	4.9	68.1	0.8	5.0	1.9	207.4
	M&W-2	% of refined materials from recycled or reused material	%	0.0	0.0	0.0	0.0	1.0	0.0	0.0
	M&W-3	Unrefined materials used on-site	Tons	204.3	0.7	0.0	0.0	0.0	0.0	204.9
	M&W-4	% of unrefined materials from recycled or reused material	%	0.0	0.0					0.0
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	0.9	444.0	0.0	0.0	67.0	511.9
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%		0.0	0.0			0.0	0.0
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.7	0.0	0.0	0.0	0.7
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	34,511.7	196.4	1,277.9	82.2	29,165.6	293.2	65,527.0
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.0	0.4	0.0	0.0	2,450.6	0.0	2,451.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	95.5	86.0	643.7	0.0	0.1	64.4	889.7
	A-2	On-site HAP emissions	Pounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	9,732.7	546.7	2,219.6	144.8	12,080.7	494.3	25,218.8
	A-3A	Total NOx emissions	Pounds	2,498.7	260.4	1,111.7	43.8	4,523.0	200.1	8,637.8
	A-3B	Total SOx emissions	Pounds	6,550.3	276.8	763.6	88.1	7,334.0	232.1	15,244.9
	A-3C	Total PM emissions	Pounds	683.6	9.4	344.3	13.0	223.7	62.1	1,336.1
	A-4	Total HAP emissions	Pounds	821.2	2.6	5.2	8.8	131.8	23.0	992.6
	A-5	Total greenhouse gas emissions	Tons CO2e*	453.5	16.0	144.1	3.4	550.9	15.6	1,183.6
Land & Ecosystems		Qualitative Description								

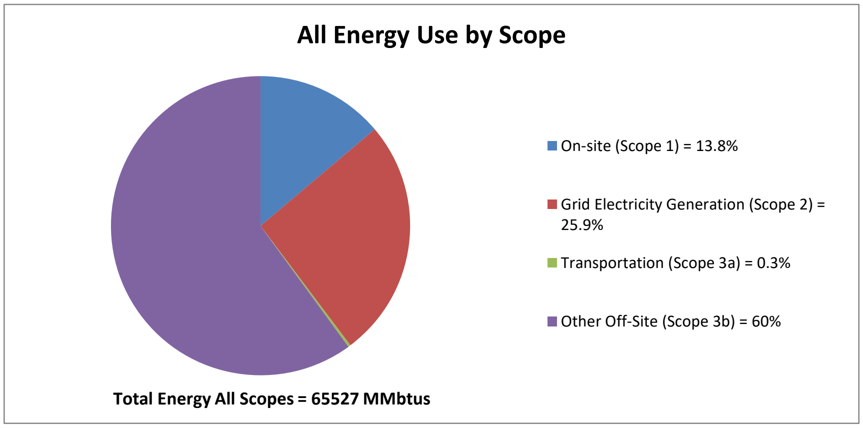
**Total greenhouse gases emissions (in CO2e) include CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)
"HAP" = hazardous air pollutants
"PM" = particulate matter
"NOx" = nitgroen oxides
"SOx" = sulfur oxides
"CO2" = carbon dioxide
"CH4" = methane
"N2O" = nitrous oxide

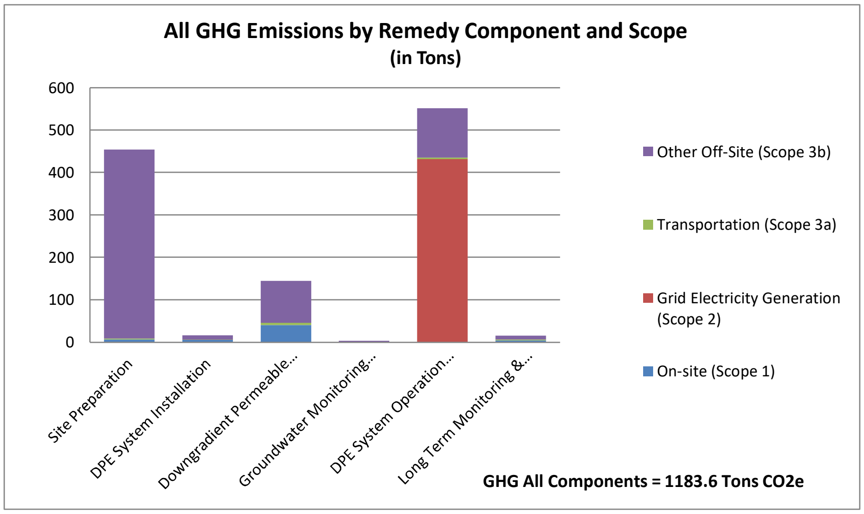
The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

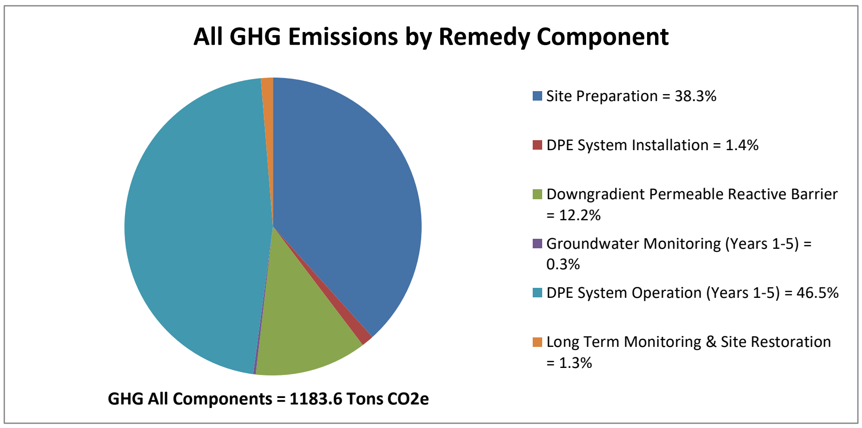
Notes:

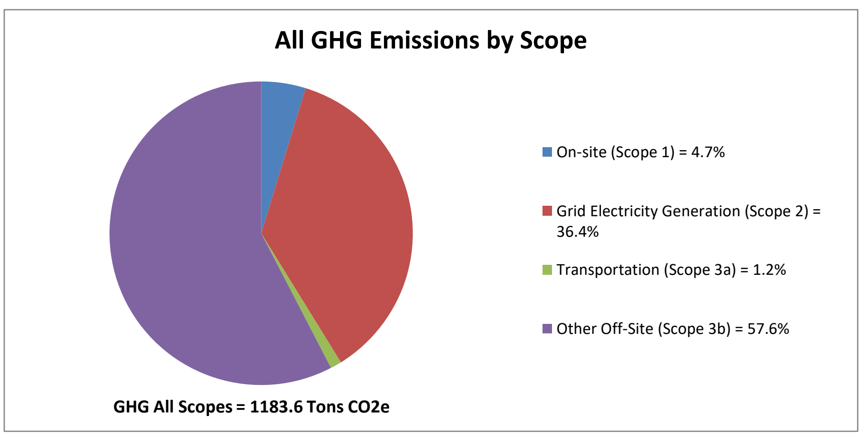

All Energy Use by Remedy Component and Scope
(in MMbtu)
40000
35000
30000
25000
20000
15000
10000
5000
0
Site Preparation
DPE System Installation
Downgradient Permeable...
Groundwater Monitoring...
DPE System Operation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 65527 MMbtus

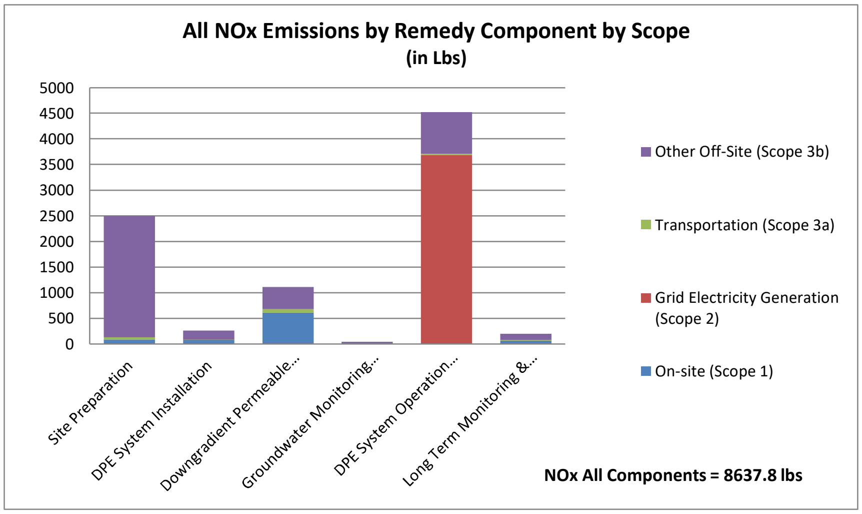

All Energy Use by Remedy Component
Site Preparation = 52.7%
DPE System Installation = 0.3%
Downgradient Permeable Reactive Barrier = 2%
Groundwater Monitoring (Years 1-5) = 0.1%
DPE System Operation (Years 1-5) = 44.5%
Long Term Monitoring & Site Restoration = 0.4%
Total Energy All Components = 65527 MMbtus

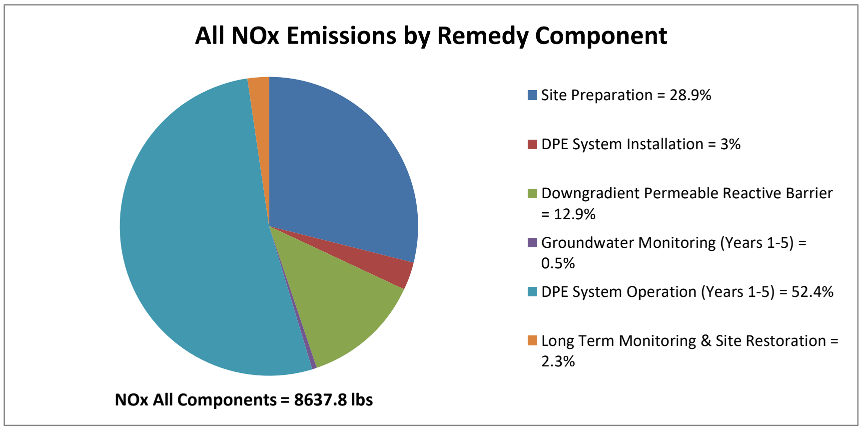

All Energy Use by Scope
On-site (Scope 1) = 13.8%
Grid Electricity Generation (Scope 2) = 25.9%
Transportation (Scope 3a) = 0.3%
Other Off-Site (Scope 3b) = 60%
Total Energy All Scopes = 65527 MMbtus

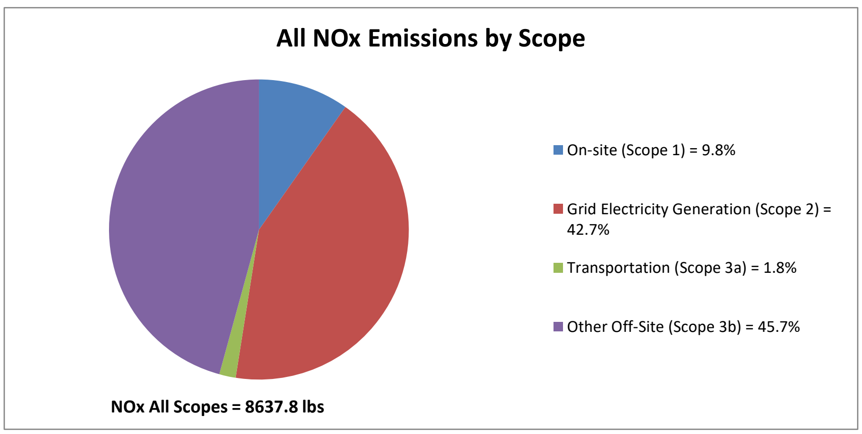

All GHG Emissions by Remedy Component and Scope
(in Tons)
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Downgradient Permeable...
Groundwater Monitoring...
DPE System Operation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 1183.6 Tons CO2e

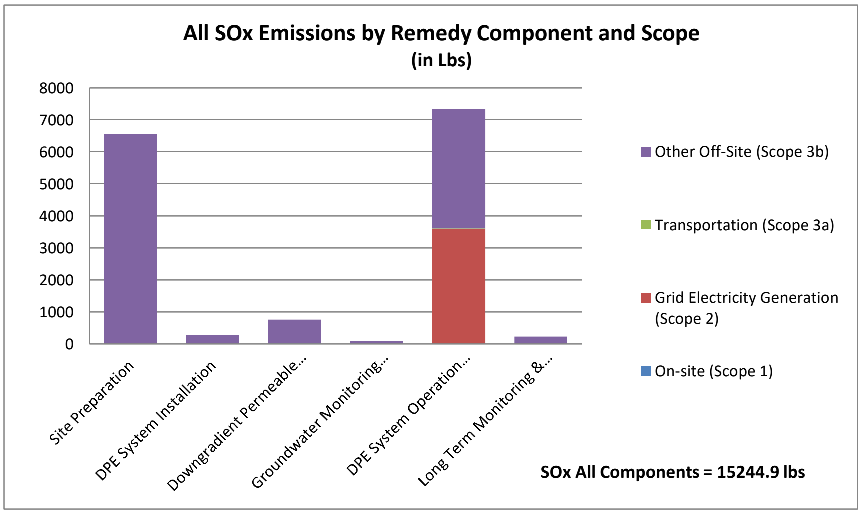

All GHG Emissions by Remedy Component
Site Preparation = 38.3%
DPE System Installation = 1.4%
Downgradient Permeable Reactive Barrier = 12.2%
Groundwater Monitoring (Years 1-5) = 0.3%
DPE System Operation (Years 1-5) = 46.5%
Long Term Monitoring & Site Restoration = 1.3%
GHG All Components = 1183.6 Tons CO2e

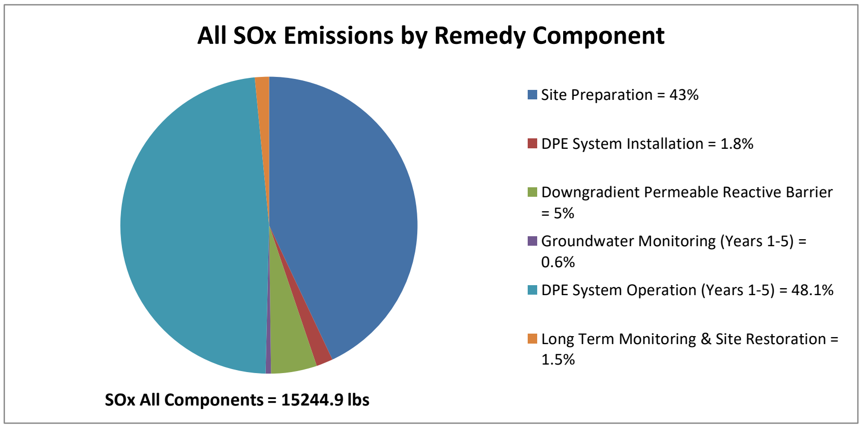

All GHG Emissions by Scope
On-site (Scope 1) = 4.7%
Grid Electricity Generation (Scope 2) = 36.4%
Transportation (Scope 3a) = 1.2%
Other Off-Site (Scope 3b) = 57.6%
GHG All Scopes = 1183.6 Tons CO2e

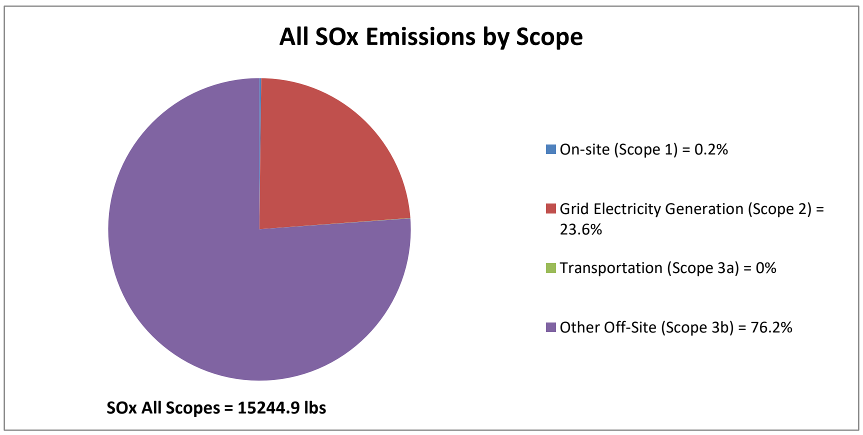

All NOx Emissions by Remedy Component by Scope
(in Lbs)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Site Preparation
DPE System Installation
Downgradient Permeable...
Groundwater Monitoring...
DPE System Operation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 8637.8 lbs

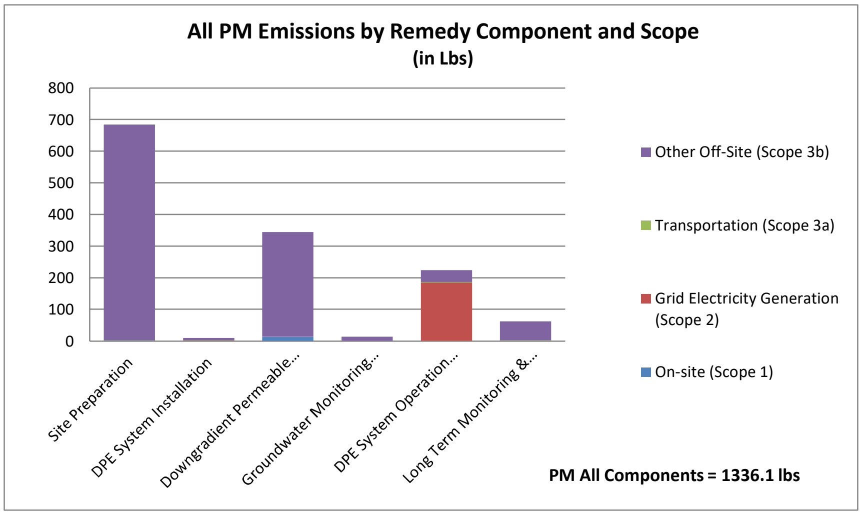

All NOx Emissions by Remedy Component
Site Preparation = 28.9%
DPE System Installation = 3%
Downgradient Permeable Reactive Barrier = 12.9%
Groundwater Monitoring (Years 1-5) = 0.5%
DPE System Operation (Years 1-5) = 52.4%
Long Term Monitoring & Site Restoration = 2.3%
NOx All Components = 8637.8 lbs

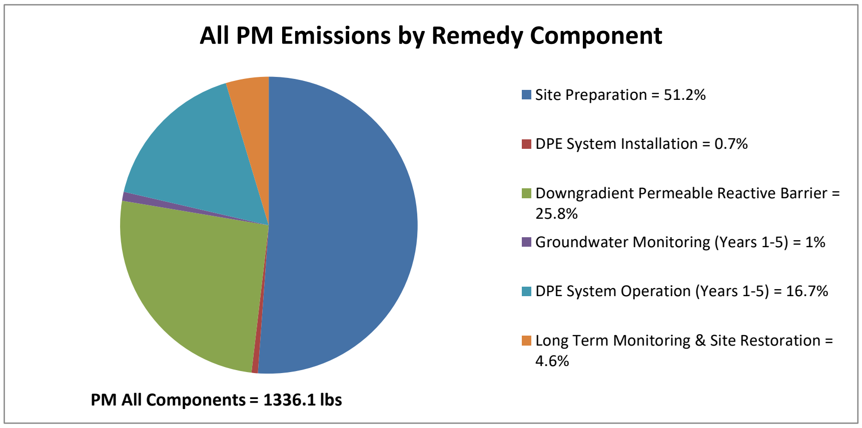

All NOx Emissions by Scope
On-site (Scope 1) = 9.8%
Grid Electricity Generation (Scope 2) = 42.7%
Transportation (Scope 3a) = 1.8%
Other Off-Site (Scope 3b) = 45.7%
NOx All Scopes = 8637.8 lbs

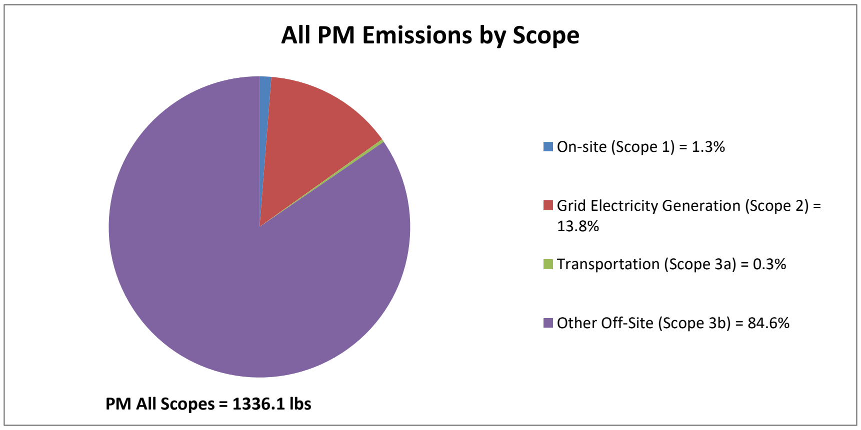

All SOx Emissions by Remedy Component and Scope
(in Lbs)
8000
7000
6000
5000
4000
3000
2000
1000
0
Site Preparation
DPE System Installation
Downgradient Permeable...
Groundwater Monitoring...
DPE System Operation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 15244.9 lbs

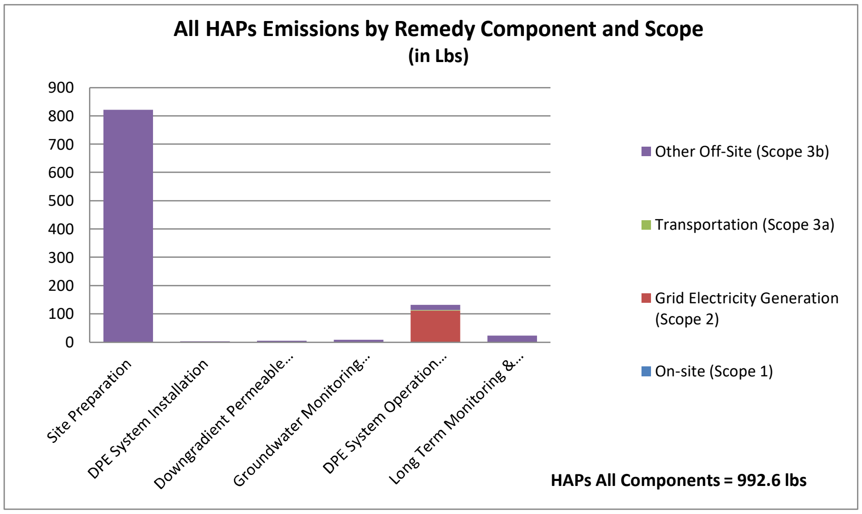

All SOx Emissions by Remedy Component
Site Preparation = 43%
DPE System Installation = 1.8%
Downgradient Permeable Reactive Barrier = 5%
Groundwater Monitoring (Years 1-5) = 0.6%
DPE System Operation (Years 1-5) = 48.1%
Long Term Monitoring & Site Restoration = 1.5%
SOx All Components = 15244.9 lbs

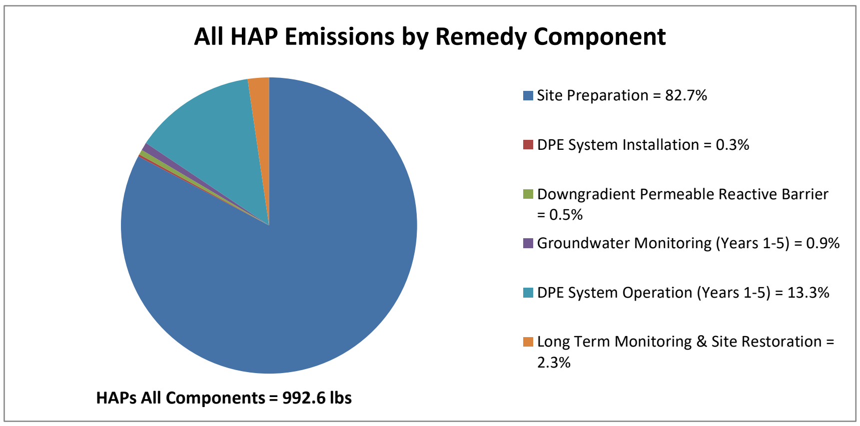

All SOx Emissions by Scope
On-site (Scope 1) = 0.2%
Grid Electricity Generation (Scope 2) = 23.6%
Transportation (Scope 3a) = 0%
Other Off-Site (Scope 3b) = 76.2%
SOx All Scopes = 15244.9 lbs

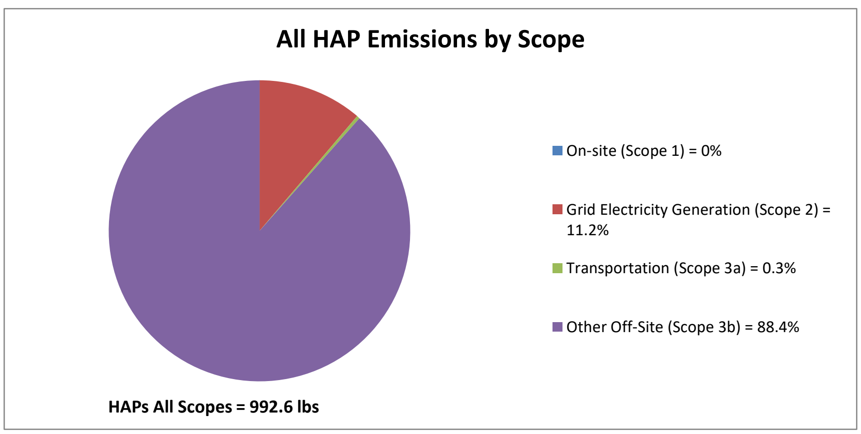

All PM Emissions by Remedy Component and Scope
(in Lbs)
800
700
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Downgradient Permeable...
Groundwater Monitoring...
DPE System Operation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 1336.1 lbs


All PM Emissions by Remedy Component
Site Preparation = 51.2%
DPE System Installation = 0.7%
Downgradient Permeable Reactive Barrier = 25.8%
Groundwater Monitoring (Years 1-5) = 1%
DPE System Operation (Years 1-5) = 16.7%
Long Term Monitoring & Site Restoration = 4.6%
PM All Components = 1336.1 lbs


All PM Emissions by Scope
On-site (Scope 1) = 1.3%
Grid Electricity Generation (Scope 2) = 13.8%
Transportation (Scope 3a) = 0.3%
Other Off-Site (Scope 3b) = 84.6%
PM All Scopes = 1336.1 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
900
800
700
600
500
400
300
200
100
0
Site Preparation
DPE System Installation
Downgradient Permeable...
Groundwater Monitoring...
DPE System Operation...
Long Term Monitoring &...
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 992.6 lbs


All HAP Emissions by Remedy Component
Site Preparation = 82.7%
DPE System Installation = 0.3%
Downgradient Permeable Reactive Barrier = 0.5%
Groundwater Monitoring (Years 1-5) = 0.9%
DPE System Operation (Years 1-5) = 13.3%
Long Term Monitoring & Site Restoration = 2.3%
HAPs All Components = 992.6 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 11.2%
Transportation (Scope 3a) = 0.3%
Other Off-Site (Scope 3b) = 88.4%
HAPs All Scopes = 992.6 lbs

ATTACHMENT 4

SEFA ANALYSIS OUTPUT – ALTERNATIVE 5

IN-SITU THERMAL TREATMENT

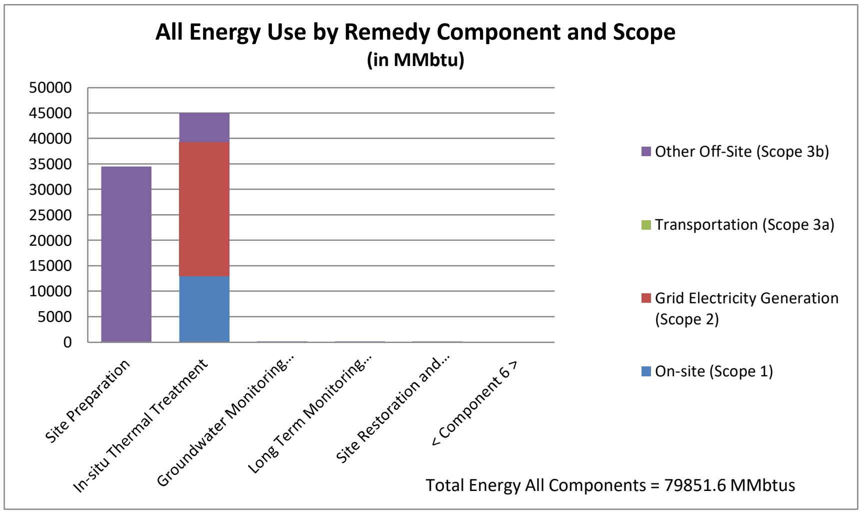
Environmental Footprint Summary

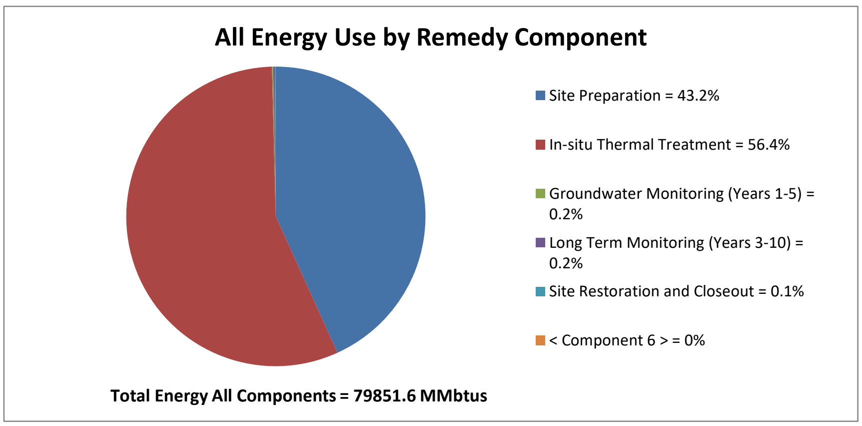
Core Element	Metric		Unit of Measure	Footprint						
				Site Preparation	In-situ Thermal Treatment	Groundwater Monitoring (Years 1-5)	Long Term Monitoring (Years 3-10)	Site Restoration and Closeout	< Component 6 >	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	126.6	0.0	1.2	1.2	0.0	0.0	129.0
	M&W-2	% of refined materials from recycled or reused material	%	0.0		0.0	0.0			0.0
	M&W-3	Unrefined materials used on-site	Tons	204.3	0.0	0.0	0.0	0.0	0.0	204.3
	M&W-4	% of unrefined materials from recycled or reused material	%	0.0						0.0
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	67.0	0.0	67.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%					0.0		0.0
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	34,511.7	44,997.6	127.6	131.5	83.2	0.0	79,851.6
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.0	3,800.0	0.0	0.0	0.0	0.0	3,800.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	95.5	0.1	0.0	0.0	64.4	0.0	160.0
	A-2	On-site HAP emissions	Pounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	9,732.7	18,366.6	230.5	231.7	128.7	0.0	28,690.2
	A-3A	Total NOx emissions	Pounds	2,498.7	6,867.5	69.0	70.0	89.2	0.0	9,594.4
	A-3B	Total SOx emissions	Pounds	6,550.3	11,168.7	140.7	140.9	10.3	0.0	18,011.0
	A-3C	Total PM emissions	Pounds	683.6	330.5	20.7	20.8	29.2	0.0	1,084.8
	A-4	Total HAP emissions	Pounds	821.2	189.9	13.9	14.1	0.7	0.0	1,039.8
	A-5	Total greenhouse gas emissions	Tons CO2e*	453.5	834.4	5.2	5.5	6.8	0.0	1,305.4
Land & Ecosystems		Qualitative Description								

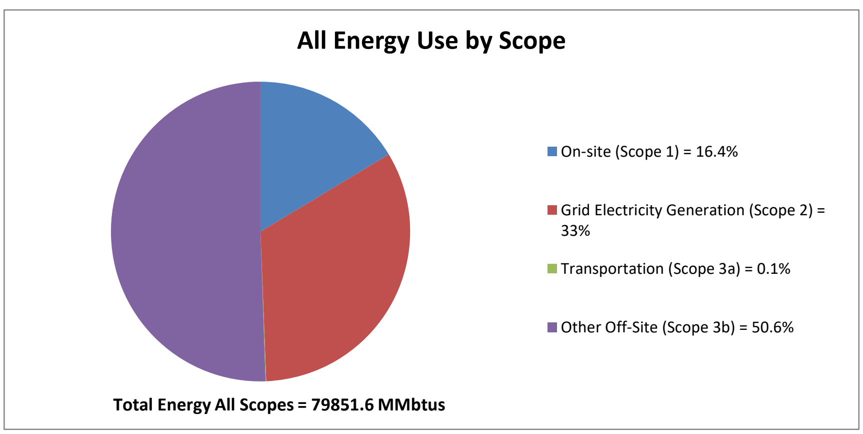
**Total greenhouse gases emissions (in CO2e) include CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)
"HAP" = hazardous air pollutants
"PM" = particulate matter
"NOx" = nitgroen oxides
"SOx" = sulfur oxides
"CO2" = carbon dioxide
"CH4" = methane
"N2O" = nitrous oxide

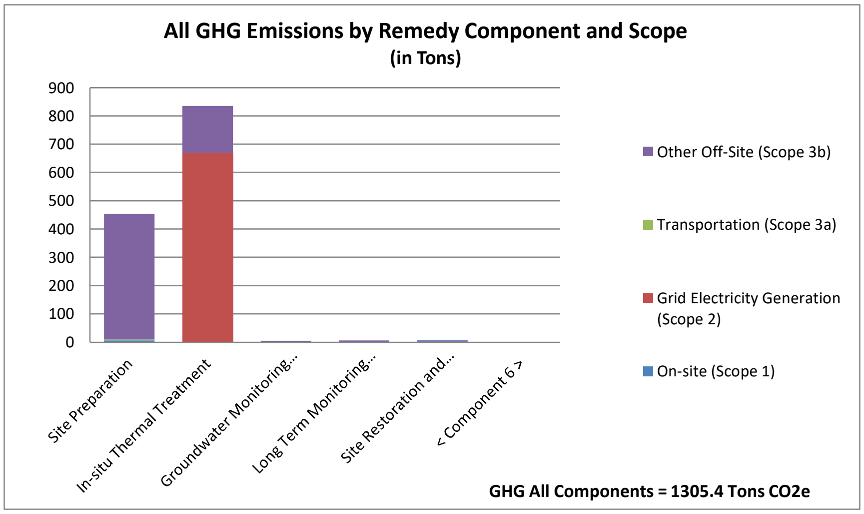
The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

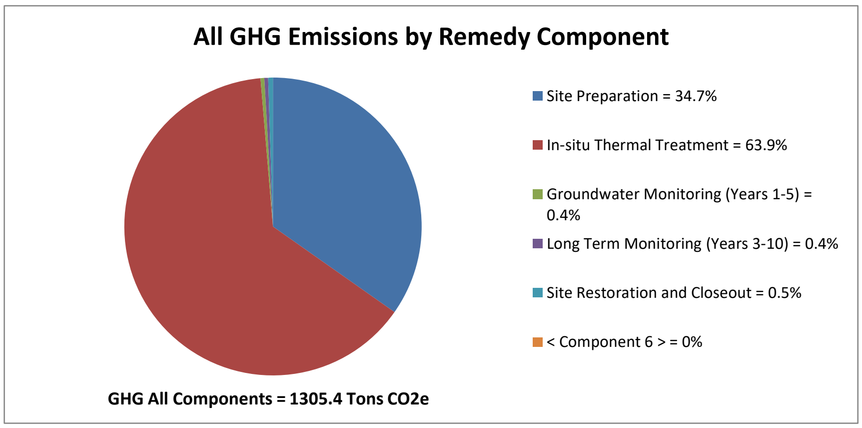
Notes: Component 6 was not used in this estimate.

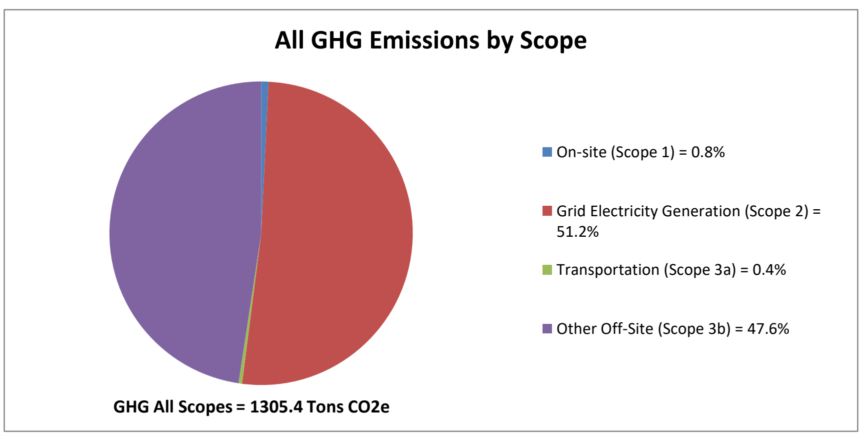

All Energy Use by Remedy Component and Scope
(in MMbtu)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Site Preparation
In-situ Thermal Treatment
Groundwater Monitoring...
Long Term Monitoring...
Site Restoration and...
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 79851.6 MMbtus

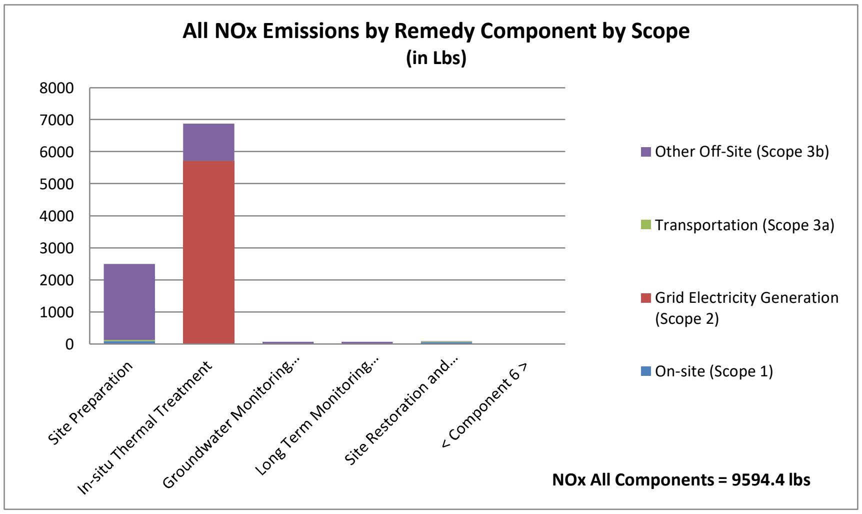

All Energy Use by Remedy Component
Site Preparation = 43.2%
In-situ Thermal Treatment = 56.4%
Groundwater Monitoring (Years 1-5) = 0.2%
Long Term Monitoring (Years 3-10) = 0.2%
Site Restoration and Closeout = 0.1%
< Component 6 > = 0%
Total Energy All Components = 79851.6 MMbtus

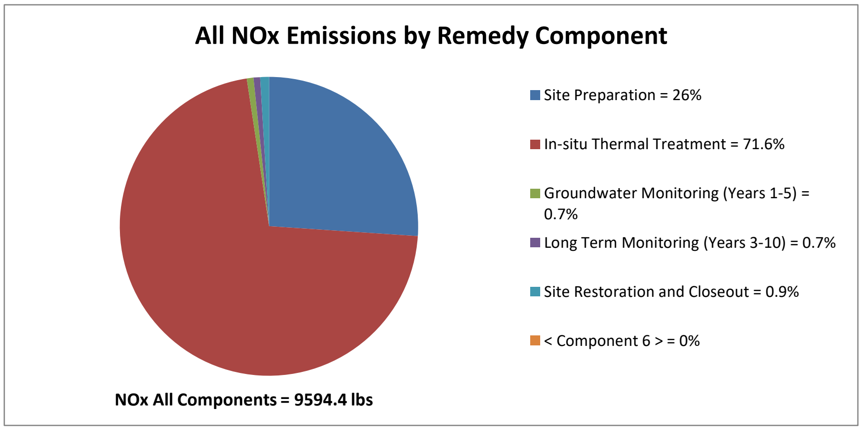

All Energy Use by Scope
On-site (Scope 1) = 16.4%
Grid Electricity Generation (Scope 2) = 33%
Transportation (Scope 3a) = 0.1%
Other Off-Site (Scope 3b) = 50.6%
Total Energy All Scopes = 79851.6 MMbtus

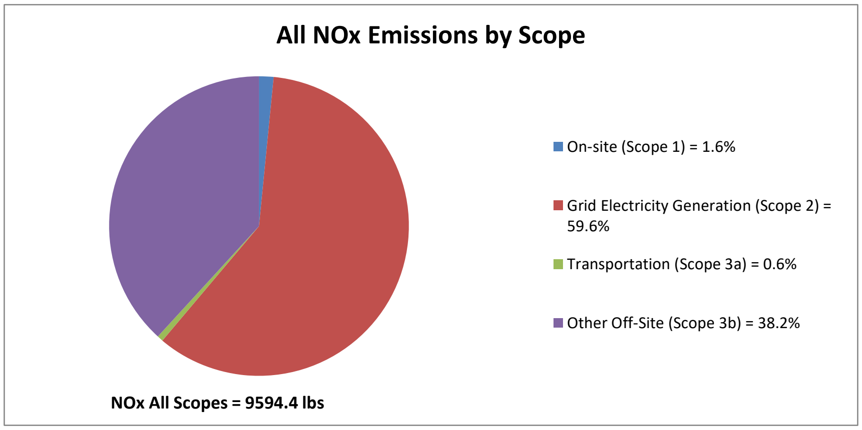

All GHG Emissions by Remedy Component and Scope
(in Tons)
900
800
700
600
500
400
300
200
100
0
Site Preparation
In-situ Thermal Treatment
Groundwater Monitoring...
Long Term Monitoring...
Site Restoration and...
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 1305.4 Tons CO2e

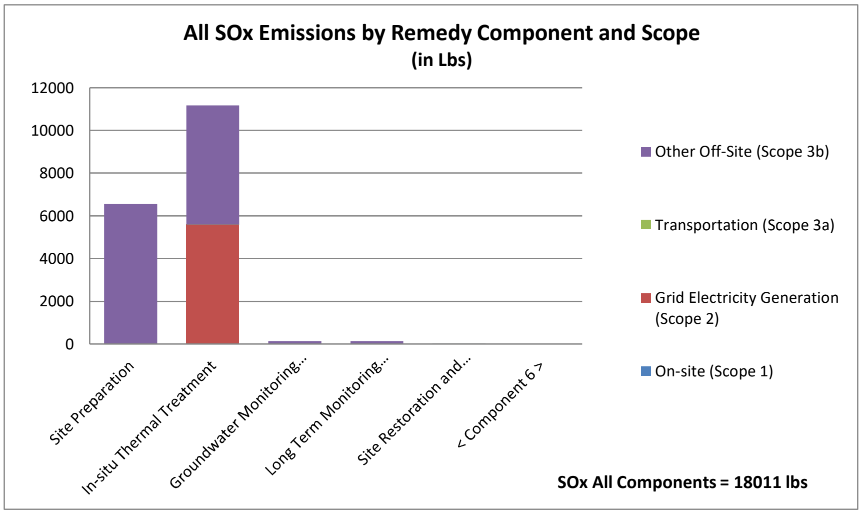

All GHG Emissions by Remedy Component
Site Preparation = 34.7%
In-situ Thermal Treatment = 63.9%
Groundwater Monitoring (Years 1-5) = 0.4%
Long Term Monitoring (Years 3-10) = 0.4%
Site Restoration and Closeout = 0.5%
< Component 6 > = 0%
GHG All Components = 1305.4 Tons CO2e

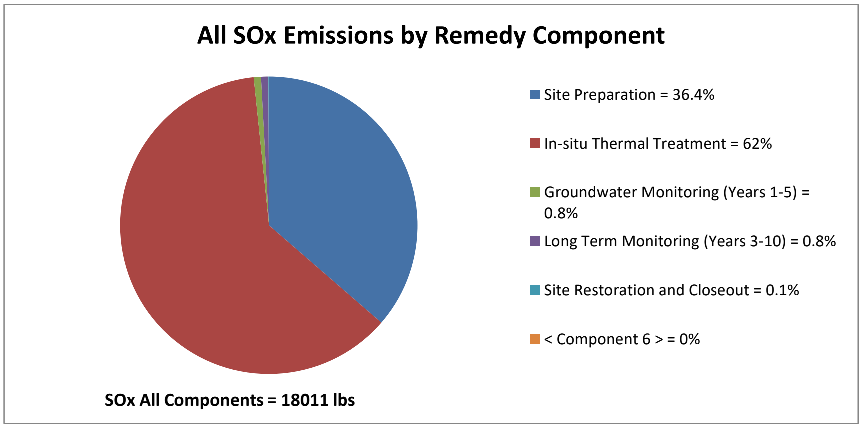

All GHG Emissions by Scope
On-site (Scope 1) = 0.8%
Grid Electricity Generation (Scope 2) = 51.2%
Transportation (Scope 3a) = 0.4%
Other Off-Site (Scope 3b) = 47.6%
GHG All Scopes = 1305.4 Tons CO2e

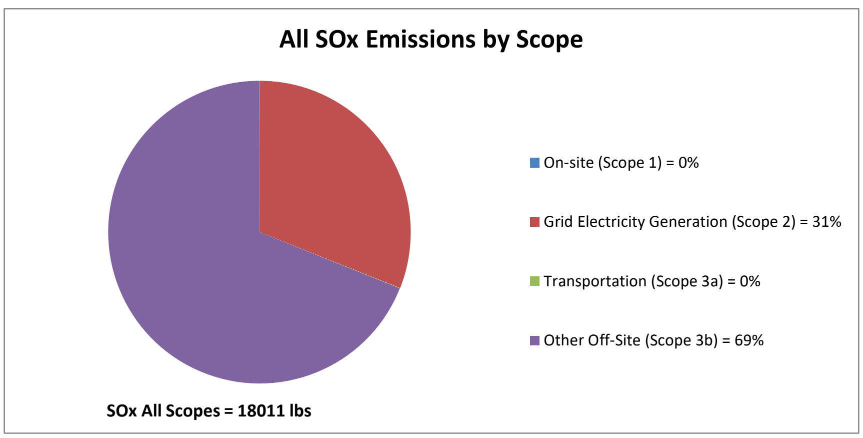

All NOx Emissions by Remedy Component by Scope
(in Lbs)
8000
7000
6000
5000
4000
3000
2000
1000
0
Site Preparation
In-situ Thermal Treatment
Groundwater Monitoring...
Long Term Monitoring...
Site Restoration and...
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 9594.4 lbs

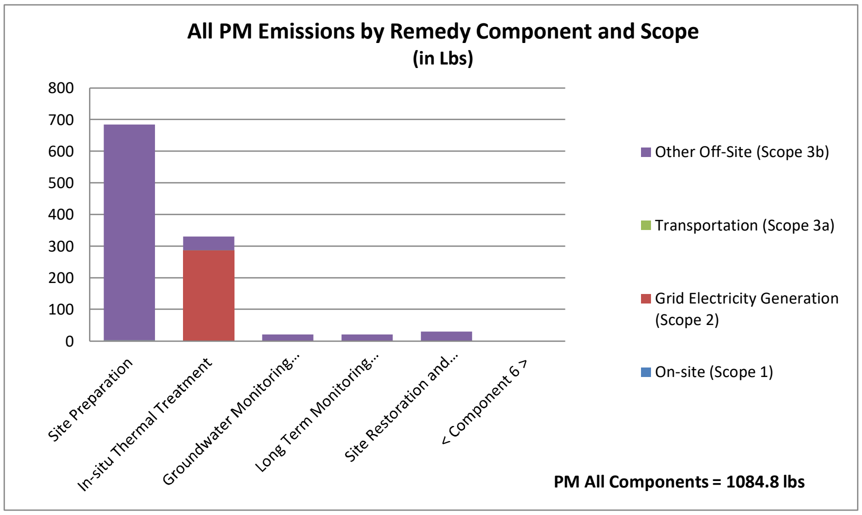

All NOx Emissions by Remedy Component
Site Preparation = 26%
In-situ Thermal Treatment = 71.6%
Groundwater Monitoring (Years 1-5) = 0.7%
Long Term Monitoring (Years 3-10) = 0.7%
Site Restoration and Closeout = 0.9%
< Component 6 > = 0%
NOx All Components = 9594.4 lbs

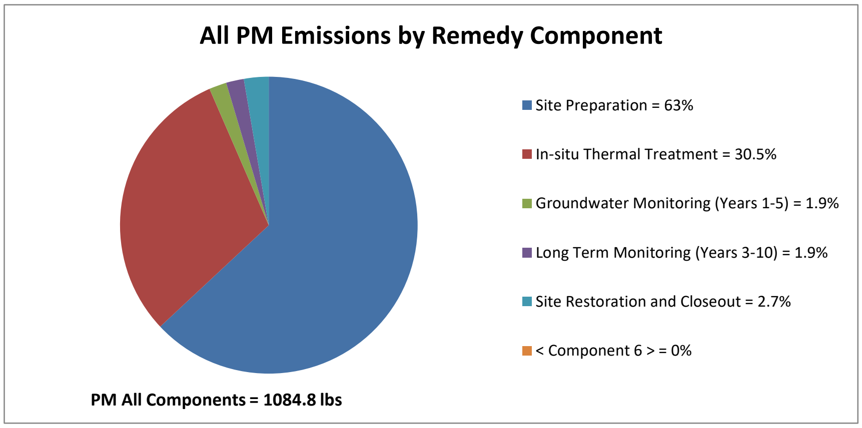

All NOx Emissions by Scope
On-site (Scope 1) = 1.6%
Grid Electricity Generation (Scope 2) = 59.6%
Transportation (Scope 3a) = 0.6%
Other Off-Site (Scope 3b) = 38.2%
NOx All Scopes = 9594.4 lbs

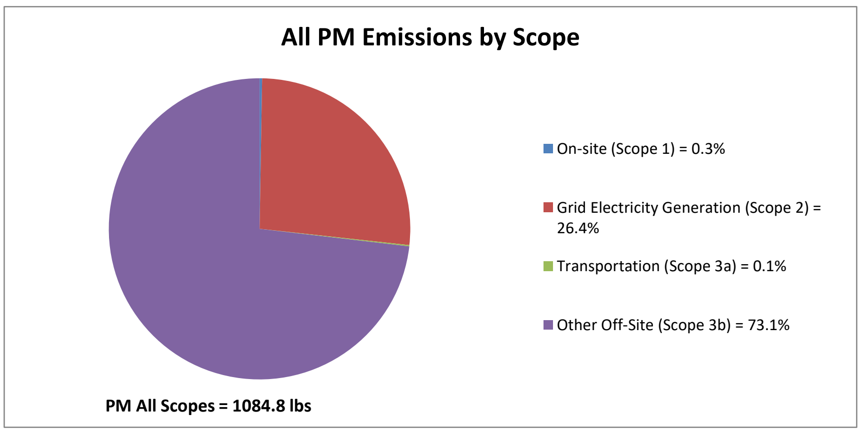

All SOx Emissions by Remedy Component and Scope
(in Lbs)
12000
10000
8000
6000
4000
2000
0
Site Preparation
In-situ Thermal Treatment
Groundwater Monitoring...
Long Term Monitoring...
Site Restoration and...
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 18011 lbs

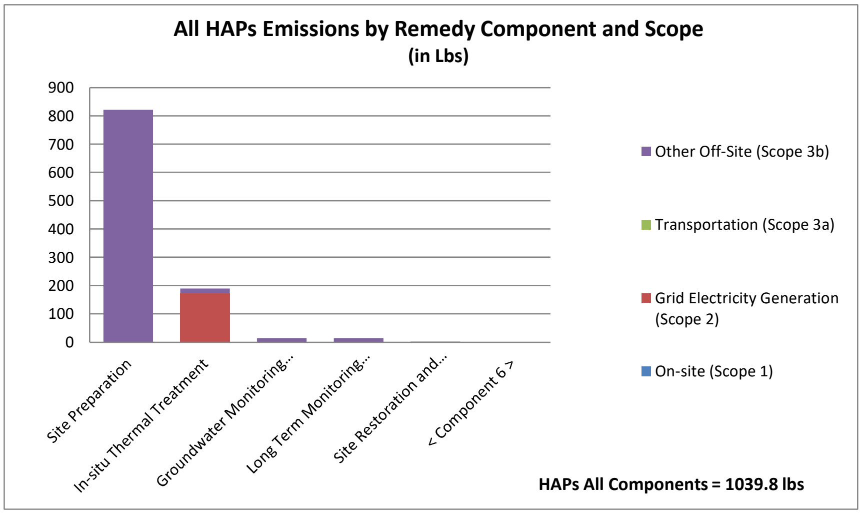

All SOx Emissions by Remedy Component
Site Preparation = 36.4%
In-situ Thermal Treatment = 62%
Groundwater Monitoring (Years 1-5) = 0.8%
Long Term Monitoring (Years 3-10) = 0.8%
Site Restoration and Closeout = 0.1%
< Component 6 > = 0%
SOx All Components = 18011 lbs

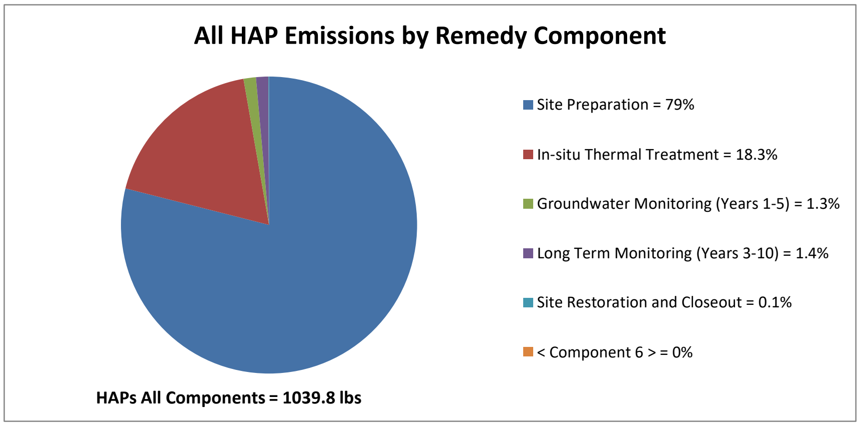

All SOx Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 31%
Transportation (Scope 3a) = 0%
Other Off-Site (Scope 3b) = 69%
SOx All Scopes = 18011 lbs

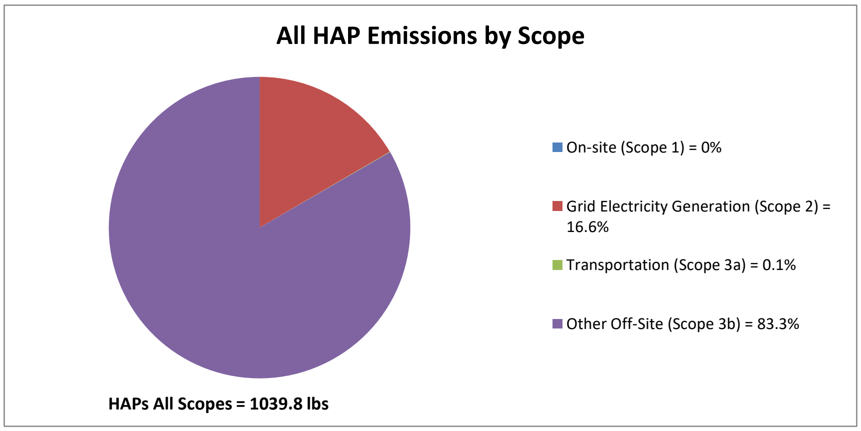

All PM Emissions by Remedy Component and Scope
(in Lbs)
800
700
600
500
400
300
200
100
0
Site Preparation
In-situ Thermal Treatment
Groundwater Monitoring...
Long Term Monitoring...
Site Restoration and...
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 1084.8 lbs


All PM Emissions by Remedy Component
Site Preparation = 63%
In-situ Thermal Treatment = 30.5%
Groundwater Monitoring (Years 1-5) = 1.9%
Long Term Monitoring (Years 3-10) = 1.9%
Site Restoration and Closeout = 2.7%
< Component 6 > = 0%
PM All Components = 1084.8 lbs


All PM Emissions by Scope
On-site (Scope 1) = 0.3%
Grid Electricity Generation (Scope 2) = 26.4%
Transportation (Scope 3a) = 0.1%
Other Off-Site (Scope 3b) = 73.1%
PM All Scopes = 1084.8 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
900
800
700
600
500
400
300
200
100
0
Site Preparation
In-situ Thermal Treatment
Groundwater Monitoring...
Long Term Monitoring...
Site Restoration and...
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 1039.8 lbs


All HAP Emissions by Remedy Component
Site Preparation = 79%
In-situ Thermal Treatment = 18.3%
Groundwater Monitoring (Years 1-5) = 1.3%
Long Term Monitoring (Years 3-10) = 1.4%
Site Restoration and Closeout = 0.1%
< Component 6 > = 0%
HAPs All Components = 1039.8 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0%
Grid Electricity Generation (Scope 2) = 16.6%
Transportation (Scope 3a) = 0.1%
Other Off-Site (Scope 3b) = 83.3%
HAPs All Scopes = 1039.8 lbs

ATTACHMENT 5

SEFA ANALYSIS OUTPUT – ALTERNATIVE 6A

SOURCE AREA SOIL EXCAVATION TO UNRESTRICTED USE SOIL CLEANUP OBJECTIVES AND OFFSITE DISPOSAL

Environmental Footprint Summary

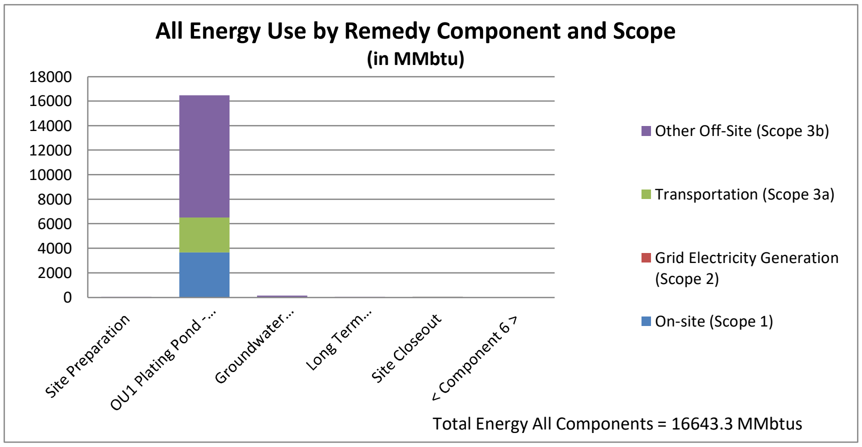
Core Element	Metric		Unit of Measure	Footprint						
				Site Preparation	OU1 Plating Pond - Excavation and Disposal	Groundwater Monitoring (Years 1-2)	Long Term Monitoring (Years 3-10)	Site Closeout	< Component 6 >	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	735.0	1.2	0.3	0.0	0.0	736.5
	M&W-2	% of refined materials from recycled or reused material	%		0.0	0.0	0.0			0.0
	M&W-3	Unrefined materials used on-site	Tons	0.0	12,000.0	0.0	0.0	0.0	0.0	12,000.0
	M&W-4	% of unrefined materials from recycled or reused material	%		0.0					0.0
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	626.0	0.0	0.0	0.0	0.0	626.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	11,893.0	0.0	0.0	0.0	0.0	11,893.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%		0.0					0.0
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	1.5	16,458.0	127.6	34.9	21.3	0.0	16,643.3
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	0.0	2,947.5	0.0	0.0	21.5	0.0	2,968.9
	A-2	On-site HAP emissions	Pounds	0.0	1.0	0.0	0.0	0.0	0.0	1.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	0.7	21,157.6	230.5	58.6	25.2	0.0	21,472.4
	A-3A	Total NOx emissions	Pounds	0.5	10,653.7	69.0	18.0	22.9	0.0	10,764.2
	A-3B	Total SOx emissions	Pounds	0.1	4,218.9	140.7	35.3	1.5	0.0	4,396.5
	A-3C	Total PM emissions	Pounds	0.1	6,284.9	20.7	5.3	0.7	0.0	6,311.7
	A-4	Total HAP emissions	Pounds	0.0	169.0	13.9	3.6	0.2	0.0	186.8
	A-5	Total greenhouse gas emissions	Tons CO2e*	0.1	1,599.9	5.2	1.5	1.7	0.0	1,608.5
Land & Ecosystems		Qualitative Description								

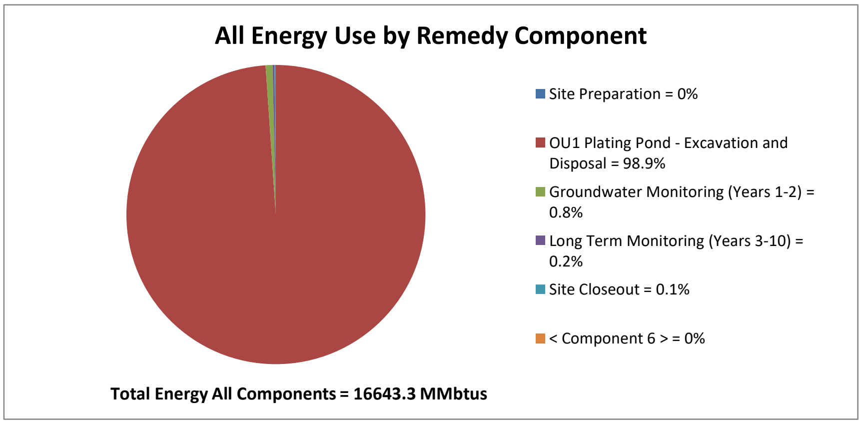
**Total greenhouse gases emissions (in CO2e) include CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)
"HAP" = hazardous air pollutants
"PM" = particulate matter
"NOx" = nitgroen oxides
"SOx" = sulfur oxides
"CO2" = carbon dioxide
"CH4" = methane
"N2O" = nitrous oxide

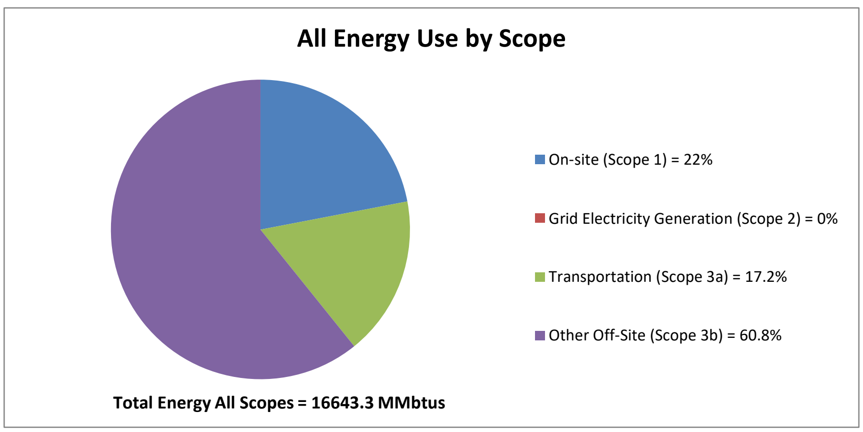
The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

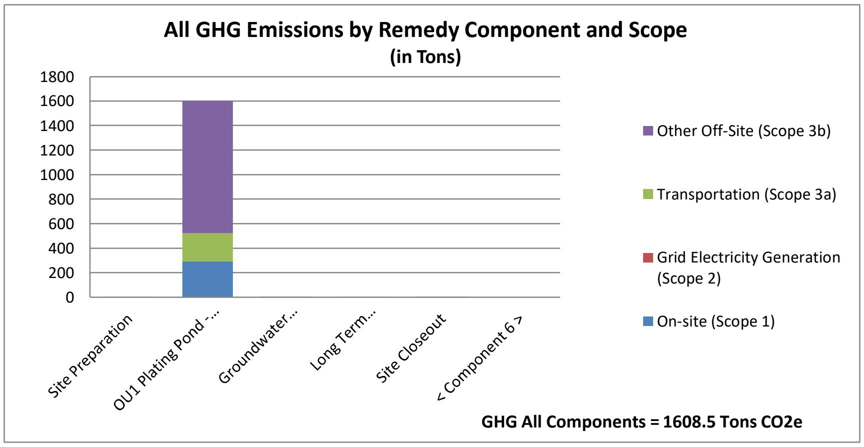
Notes: Component 6 was not used in this estimate.

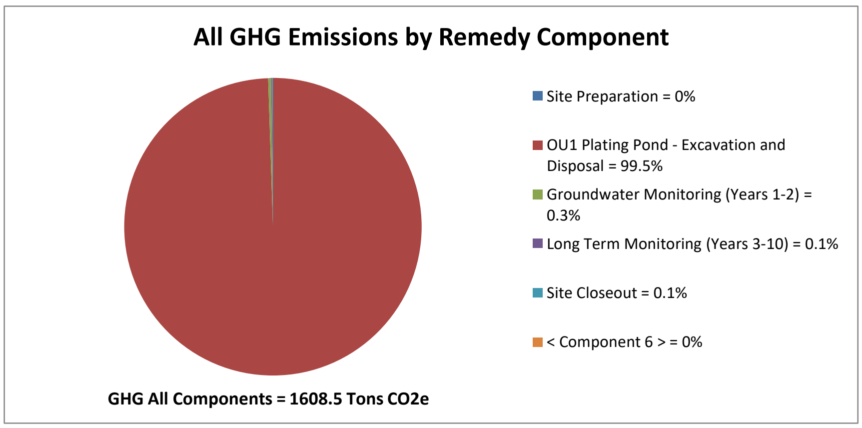
TRC

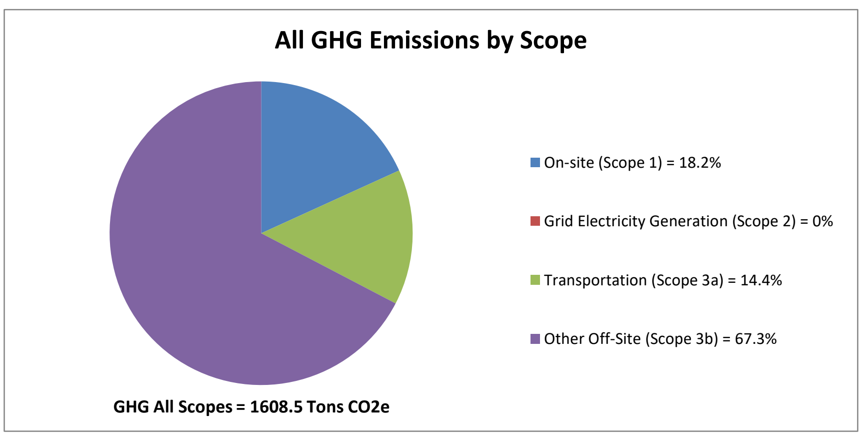

All Energy Use by Remedy Component and Scope
(in MMbtu)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 16643.3 MMbtus

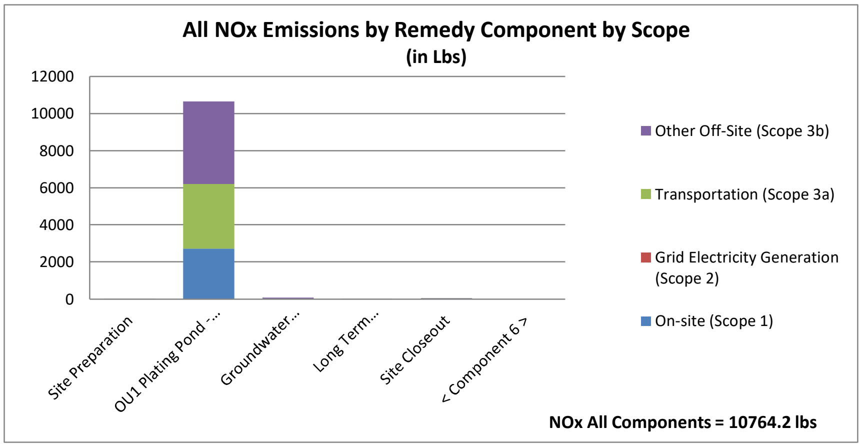

All Energy Use by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 98.9%
Groundwater Monitoring (Years 1-2) = 0.8%
Long Term Monitoring (Years 3-10) = 0.2%
Site Closeout = 0.1%
< Component 6 > = 0%
Total Energy All Components = 16643.3 MMbtus

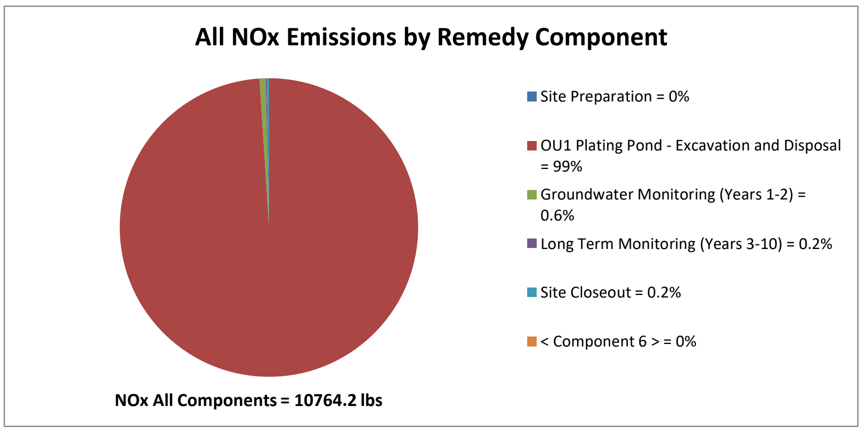

All Energy Use by Scope
On-site (Scope 1) = 22%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 17.2%
Other Off-Site (Scope 3b) = 60.8%
Total Energy All Scopes = 16643.3 MMbtus

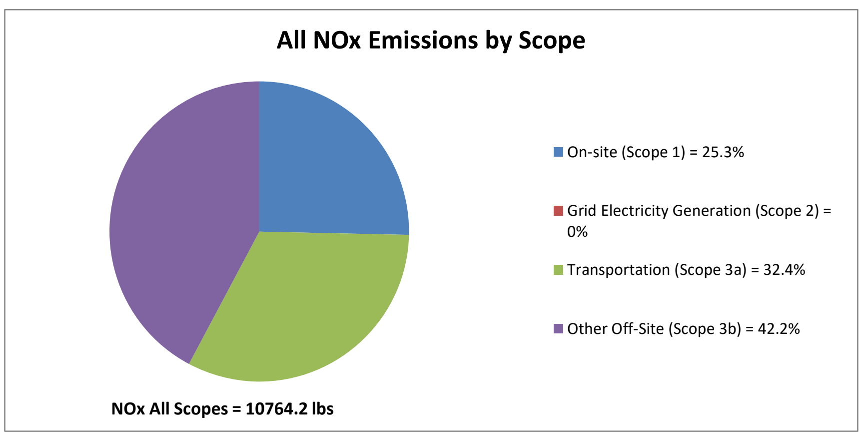

All GHG Emissions by Remedy Component and Scope
(in Tons)
1800
1600
1400
1200
1000
800
600
400
200
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 1608.5 Tons CO2e

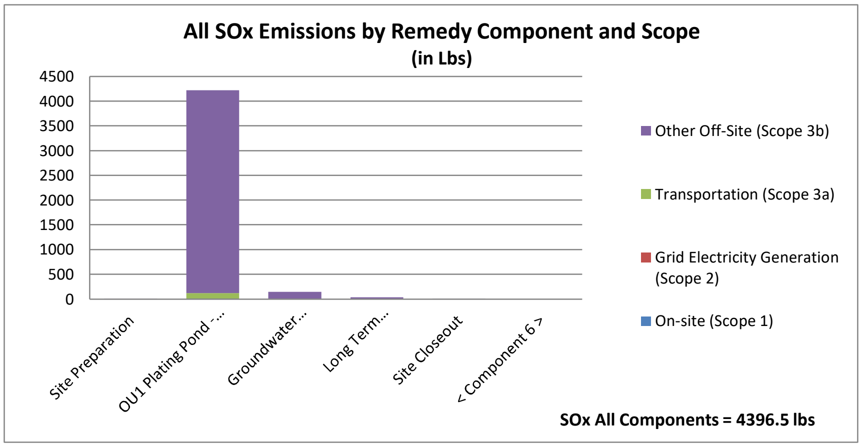

All GHG Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 99.5%
Groundwater Monitoring (Years 1-2) = 0.3%
Long Term Monitoring (Years 3-10) = 0.1%
Site Closeout = 0.1%
< Component 6 > = 0%
GHG All Components = 1608.5 Tons CO2e

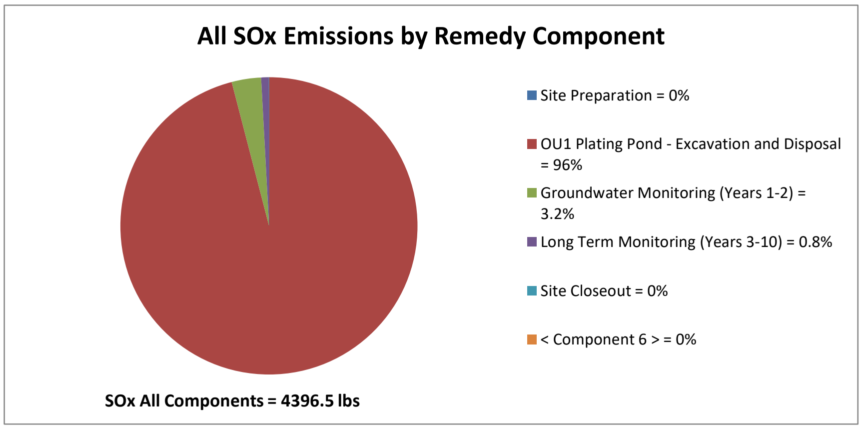

All GHG Emissions by Scope
On-site (Scope 1) = 18.2%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 14.4%
Other Off-Site (Scope 3b) = 67.3%
GHG All Scopes = 1608.5 Tons CO2e

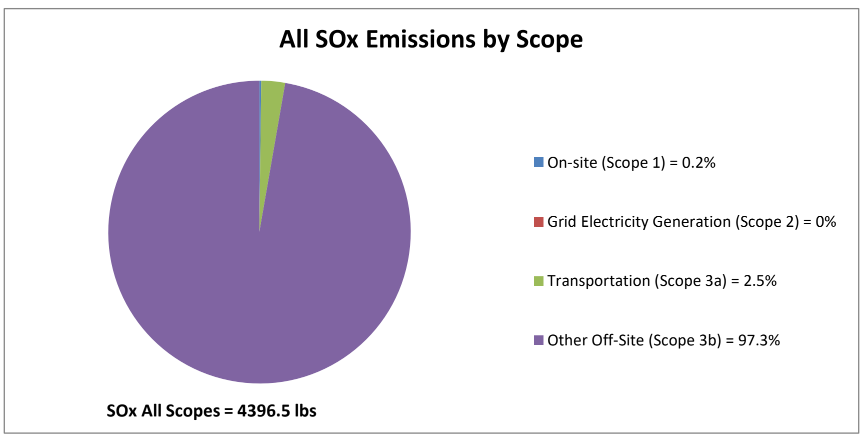

All NOx Emissions by Remedy Component by Scope
(in Lbs)
12000
10000
8000
6000
4000
2000
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 10764.2 lbs

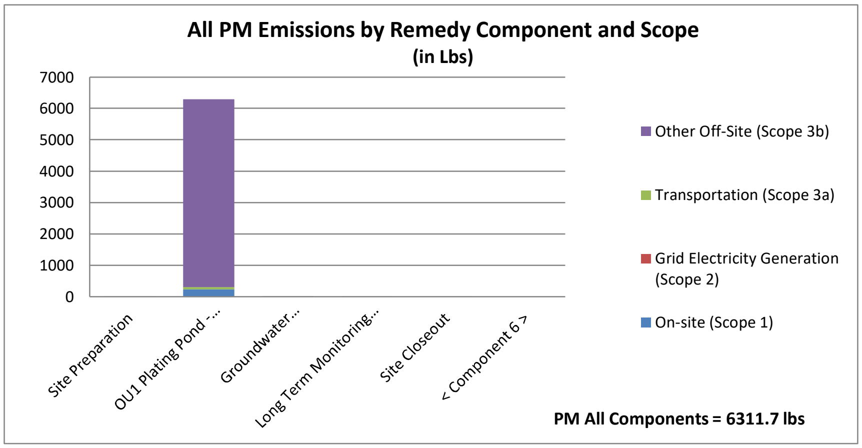

All NOx Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 99%
Groundwater Monitoring (Years 1-2) = 0.6%
Long Term Monitoring (Years 3-10) = 0.2%
Site Closeout = 0.2%
< Component 6 > = 0%
NOx All Components = 10764.2 lbs

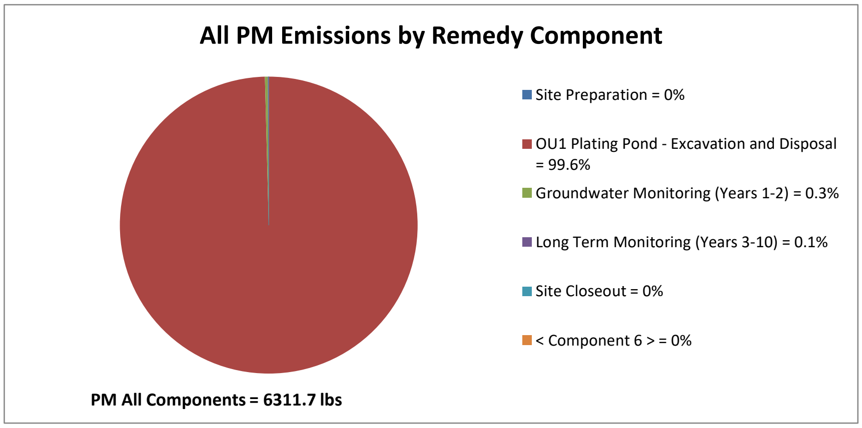

All NOx Emissions by Scope
On-site (Scope 1) = 25.3%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 32.4%
Other Off-Site (Scope 3b) = 42.2%
NOx All Scopes = 10764.2 lbs

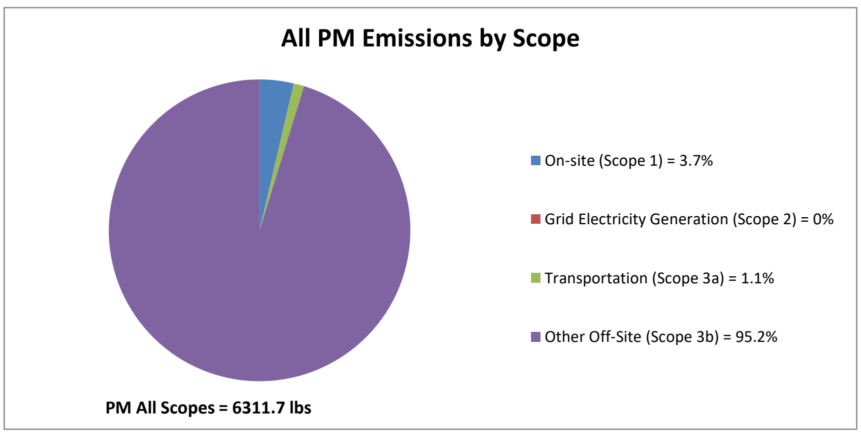

All SOx Emissions by Remedy Component and Scope
(in Lbs)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 4396.5 lbs

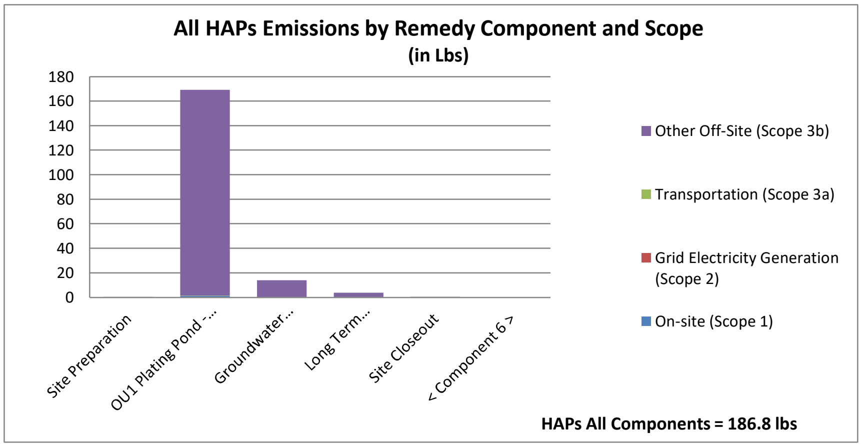

All SOx Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 96%
Groundwater Monitoring (Years 1-2) = 3.2%
Long Term Monitoring (Years 3-10) = 0.8%
Site Closeout = 0%
< Component 6 > = 0%
SOx All Components = 4396.5 lbs

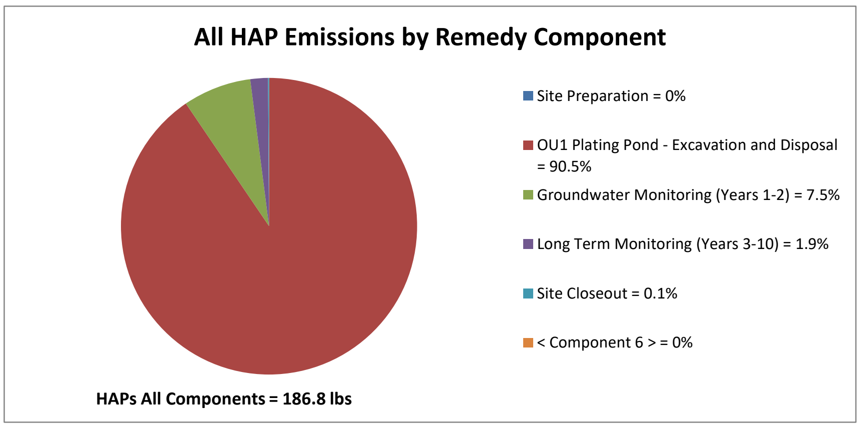

All SOx Emissions by Scope
On-site (Scope 1) = 0.2%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 2.5%
Other Off-Site (Scope 3b) = 97.3%
SOx All Scopes = 4396.5 lbs

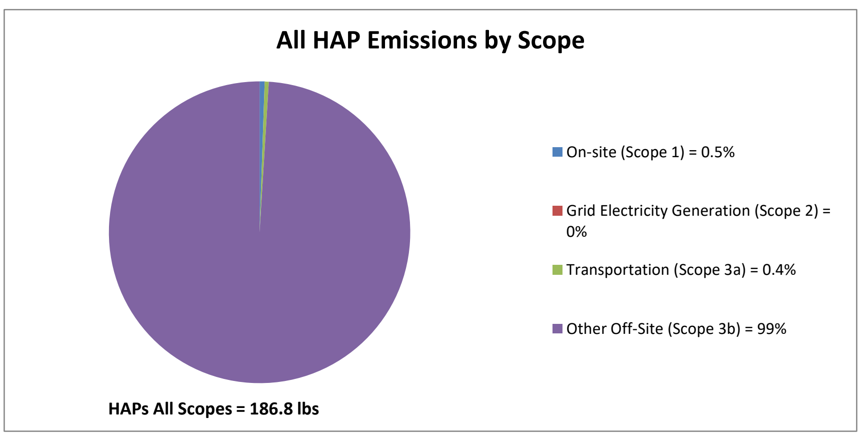

All PM Emissions by Remedy Component and Scope
(in Lbs)
7000
6000
5000
4000
3000
2000
1000
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term Monitoring...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 6311.7 lbs


All PM Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 99.6%
Groundwater Monitoring (Years 1-2) = 0.3%
Long Term Monitoring (Years 3-10) = 0.1%
Site Closeout = 0%
< Component 6 > = 0%
PM All Components = 6311.7 lbs


All PM Emissions by Scope
On-site (Scope 1) = 3.7%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 1.1%
Other Off-Site (Scope 3b) = 95.2%
PM All Scopes = 6311.7 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
180
160
140
120
100
80
60
40
20
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 186.8 lbs


All HAP Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 90.5%
Groundwater Monitoring (Years 1-2) = 7.5%
Long Term Monitoring (Years 3-10) = 1.9%
Site Closeout = 0.1%
< Component 6 > = 0%
HAPs All Components = 186.8 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0.5%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.4%
Other Off-Site (Scope 3b) = 99%
HAPs All Scopes = 186.8 lbs

ATTACHMENT 6

SEFA ANALYSIS OUTPUT – ALTERNATIVE 6B

SOURCE AREA SOIL EXCAVATION TO COMMERCIAL USE SOIL CLEANUP OBJECTIVES AND OFFSITE DISPOSAL

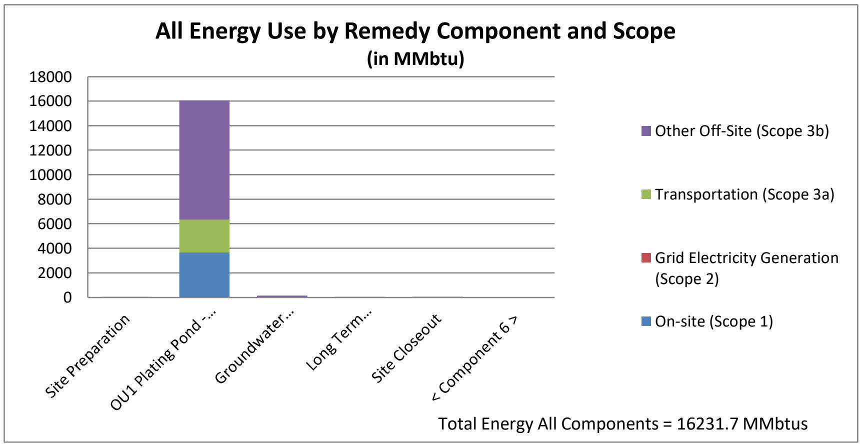
Environmental Footprint Summary

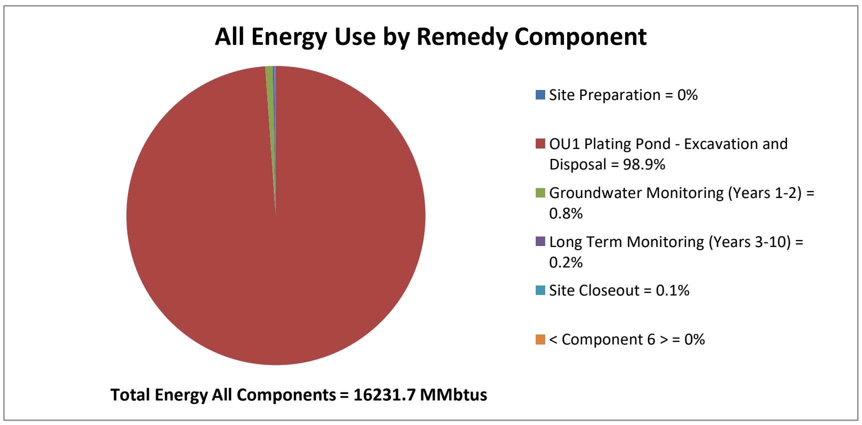
Core Element	Metric		Unit of Measure	Footprint						
				Site Preparation	OU1 Plating Pond - Excavation and Disposal	Groundwater Monitoring (Years 1-2)	Long Term Monitoring (Years 3-10)	Site Closeout	< Component 6 >	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	735.0	1.2	0.3	0.0	0.0	736.5
	M&W-2	% of refined materials from recycled or reused material	%		0.0	0.0	0.0			0.0
	M&W-3	Unrefined materials used on-site	Tons	0.0	11,250.0	0.0	0.0	0.0	0.0	11,250.0
	M&W-4	% of unrefined materials from recycled or reused material	%		0.0					0.0
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	579.0	0.0	0.0	0.0	0.0	579.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	0.0	11,001.0	0.0	0.0	0.0	0.0	11,001.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%		0.0					0.0
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-2	Groundwater use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	1.5	16,046.4	127.6	34.9	21.3	0.0	16,231.7
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	0.0	2,947.5	0.0	0.0	21.5	0.0	2,968.9
	A-2	On-site HAP emissions	Pounds	0.0	1.0	0.0	0.0	0.0	0.0	1.0
	A-3	Total NOx, SOx, and PM emissions	Pounds	0.7	20,258.4	230.5	58.6	25.2	0.0	20,573.3
	A-3A	Total NOx emissions	Pounds	0.5	10,251.7	69.0	18.0	22.9	0.0	10,362.2
	A-3B	Total SOx emissions	Pounds	0.1	4,109.4	140.7	35.3	1.5	0.0	4,287.0
	A-3C	Total PM emissions	Pounds	0.1	5,897.3	20.7	5.3	0.7	0.0	5,924.1
	A-4	Total HAP emissions	Pounds	0.0	166.2	13.9	3.6	0.2	0.0	184.0
	A-5	Total greenhouse gas emissions	Tons CO2e*	0.1	1,567.7	5.2	1.5	1.7	0.0	1,576.3
Land & Ecosystems		Qualitative Description								

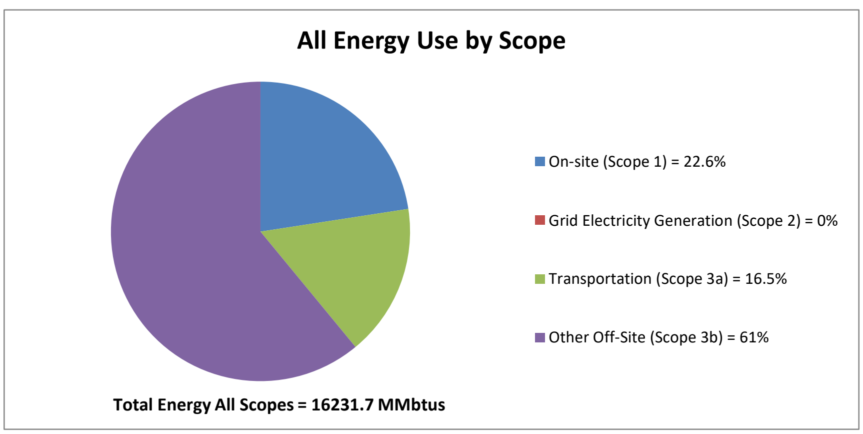
**Total greenhouse gases emissions (in CO2e) include CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)
"HAP" = hazardous air pollutants
"PM" = particulate matter
"NOx" = nitgroen oxides
"SOx" = sulfur oxides
"CO2" = carbon dioxide
"CH4" = methane
"N2O" = nitrous oxide

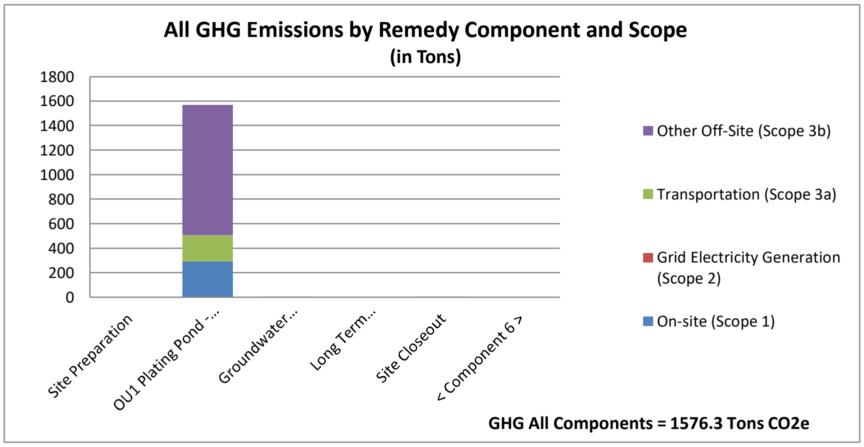
The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

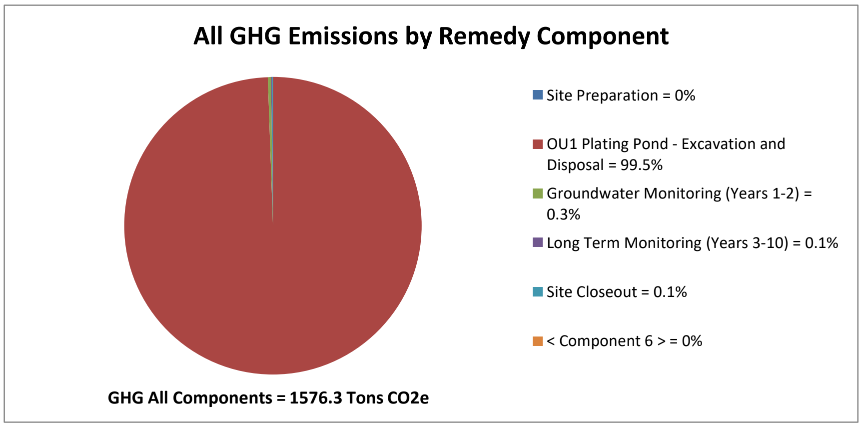
Notes: Component 6 was not used in this estimate.

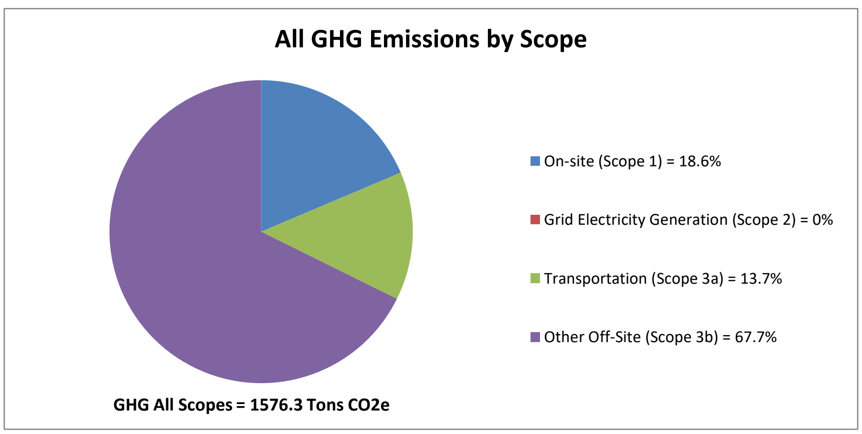

All Energy Use by Remedy Component and Scope
(in MMbtu)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 16231.7 MMbtus

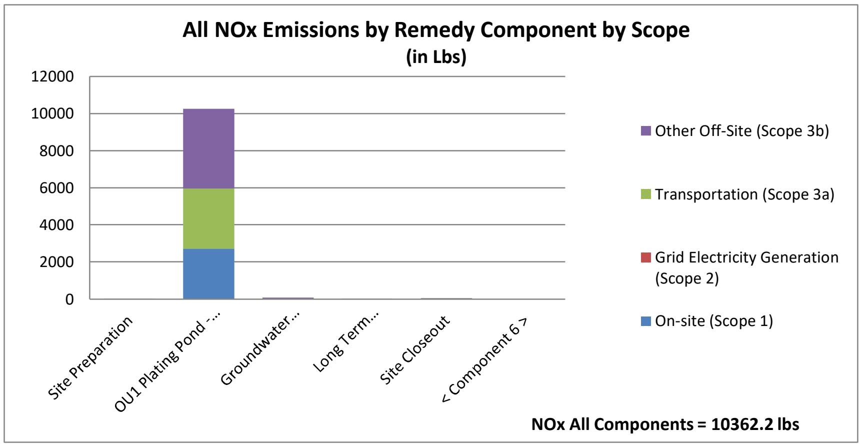

All Energy Use by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 98.9%
Groundwater Monitoring (Years 1-2) = 0.8%
Long Term Monitoring (Years 3-10) = 0.2%
Site Closeout = 0.1%
< Component 6 > = 0%
Total Energy All Components = 16231.7 MMbtus

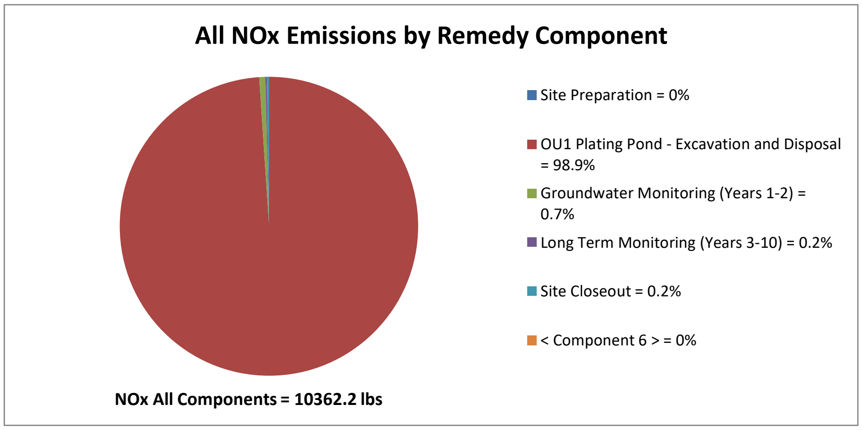

All Energy Use by Scope
On-site (Scope 1) = 22.6%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 16.5%
Other Off-Site (Scope 3b) = 61%
Total Energy All Scopes = 16231.7 MMbtus

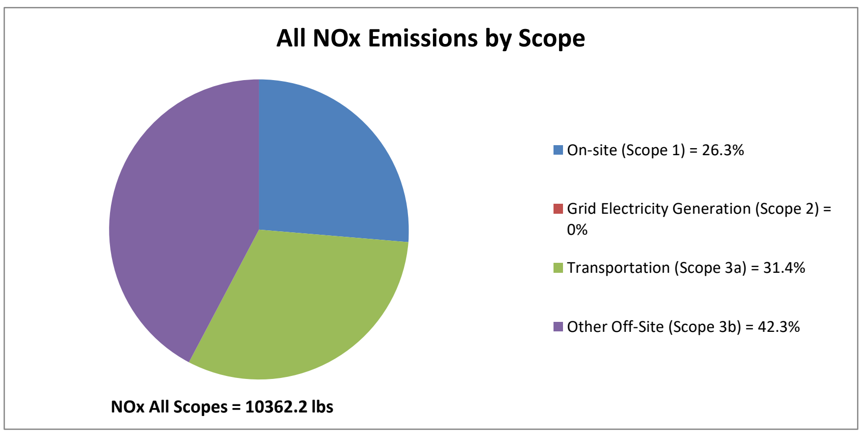

All GHG Emissions by Remedy Component and Scope
(in Tons)
1800
1600
1400
1200
1000
800
600
400
200
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 1576.3 Tons CO2e

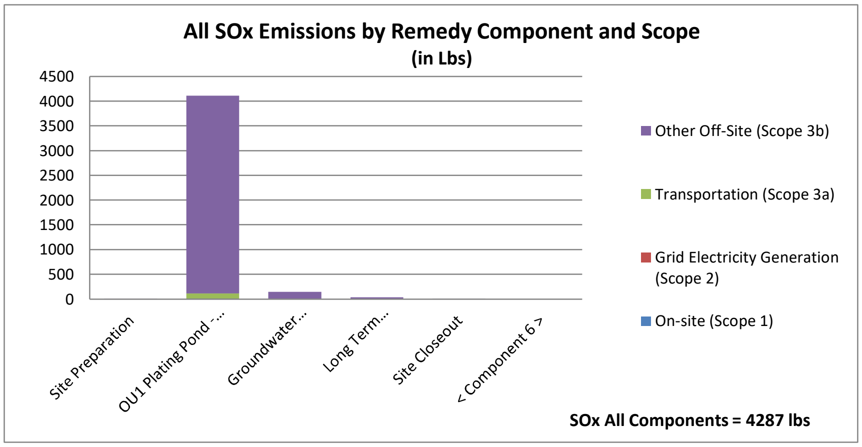

All GHG Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 99.5%
Groundwater Monitoring (Years 1-2) = 0.3%
Long Term Monitoring (Years 3-10) = 0.1%
Site Closeout = 0.1%
< Component 6 > = 0%
GHG All Components = 1576.3 Tons CO2e

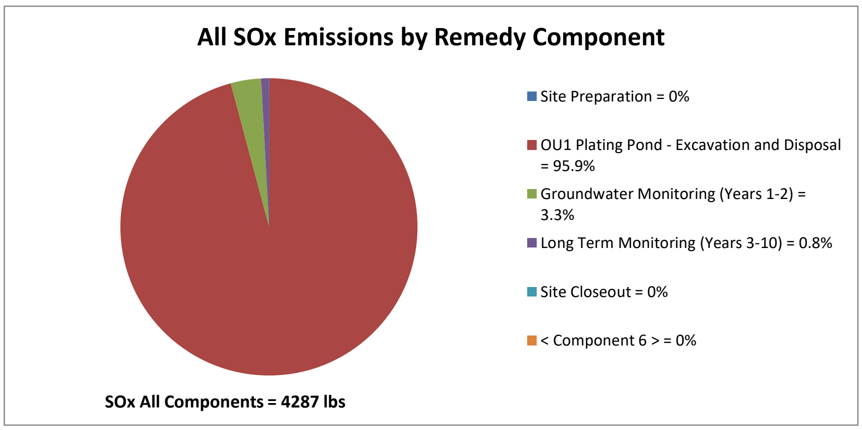

All GHG Emissions by Scope
On-site (Scope 1) = 18.6%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 13.7%
Other Off-Site (Scope 3b) = 67.7%
GHG All Scopes = 1576.3 Tons CO2e

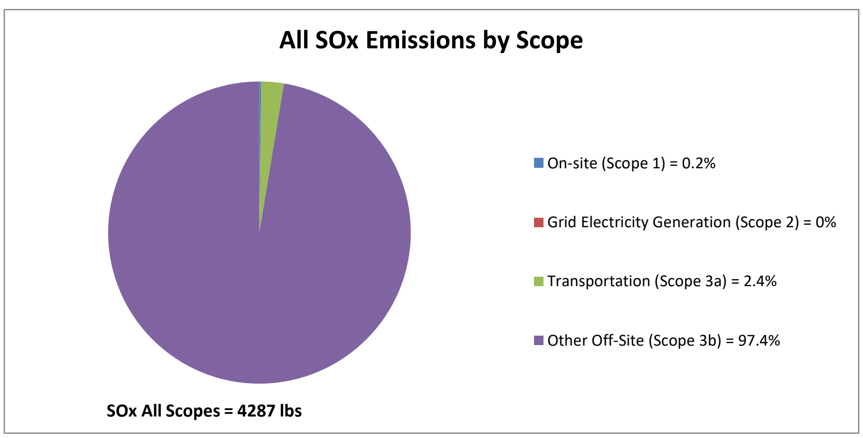

All NOx Emissions by Remedy Component by Scope
(in Lbs)
12000
10000
8000
6000
4000
2000
0
Site Preparation
OU1 Plating Pond - ...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 10362.2 lbs

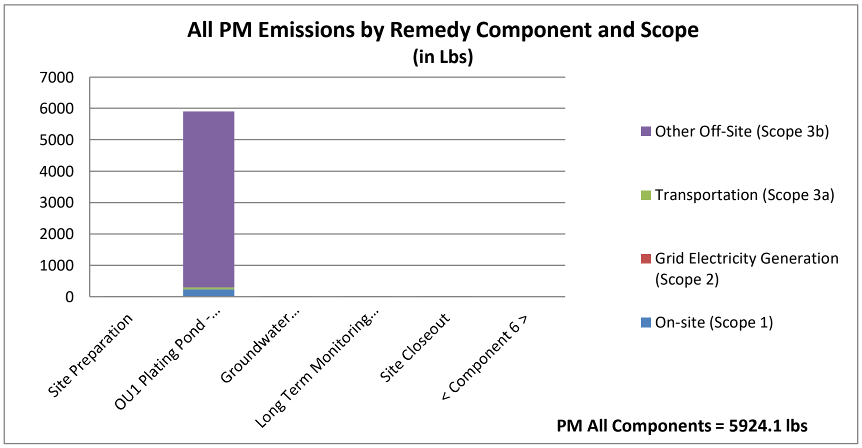

All NOx Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 98.9%
Groundwater Monitoring (Years 1-2) = 0.7%
Long Term Monitoring (Years 3-10) = 0.2%
Site Closeout = 0.2%
< Component 6 > = 0%
NOx All Components = 10362.2 lbs

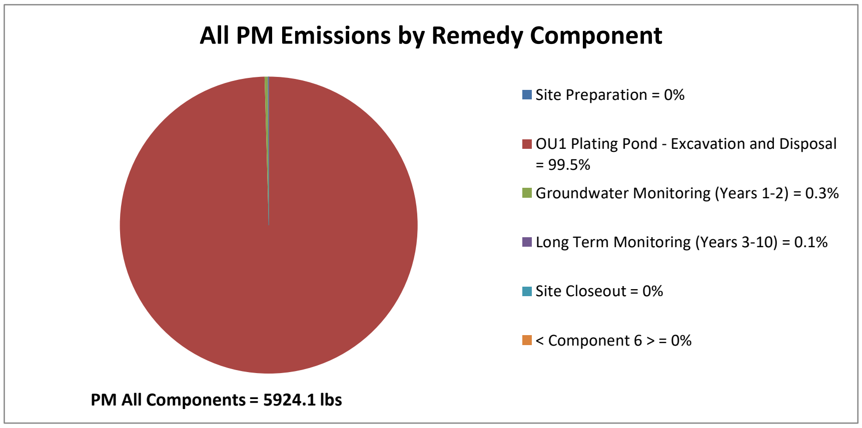

All NOx Emissions by Scope
On-site (Scope 1) = 26.3%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 31.4%
Other Off-Site (Scope 3b) = 42.3%
NOx All Scopes = 10362.2 lbs

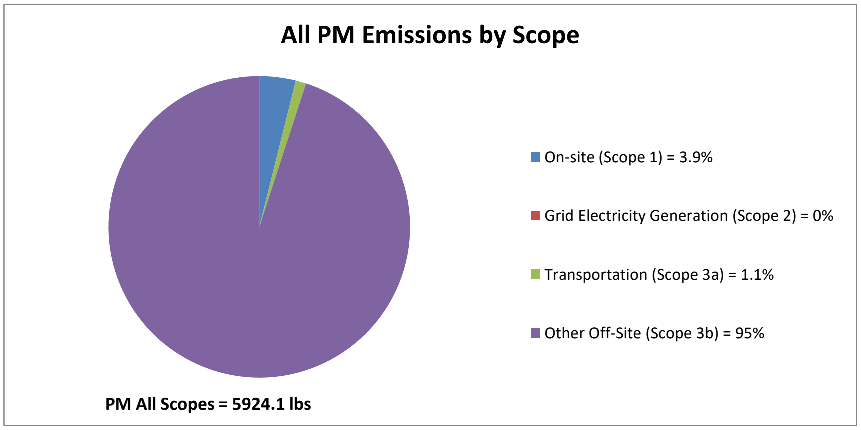

All SOx Emissions by Remedy Component and Scope
(in Lbs)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 4287 lbs

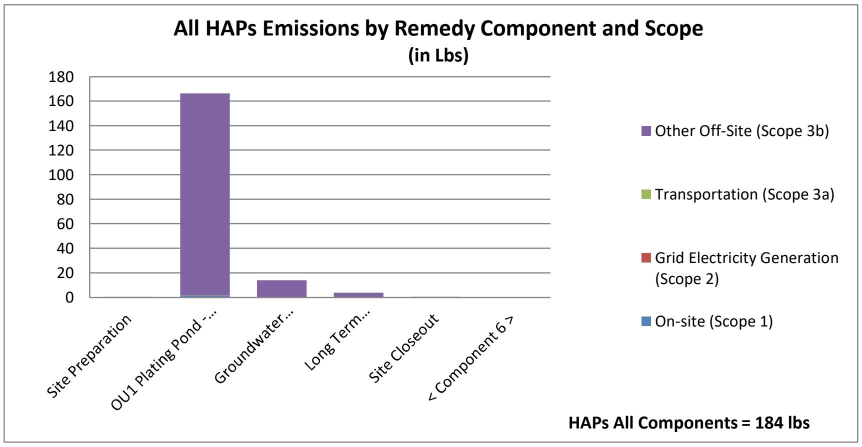

All SOx Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 95.9%
Groundwater Monitoring (Years 1-2) = 3.3%
Long Term Monitoring (Years 3-10) = 0.8%
Site Closeout = 0%
< Component 6 > = 0%
SOx All Components = 4287 lbs

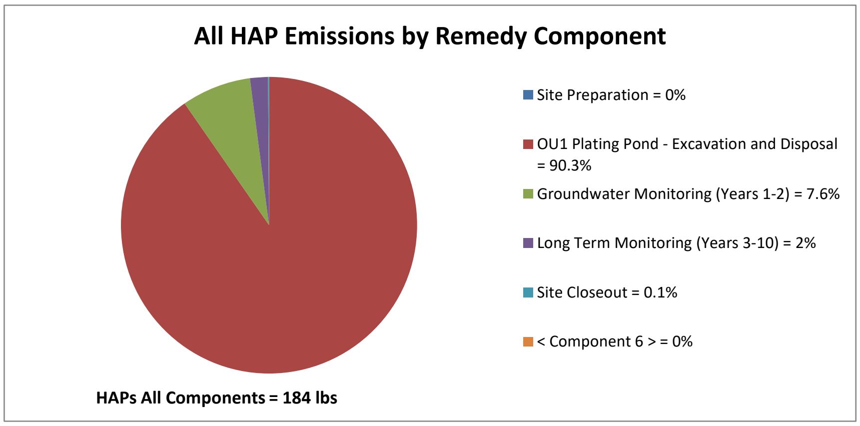

All SOx Emissions by Scope
On-site (Scope 1) = 0.2%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 2.4%
Other Off-Site (Scope 3b) = 97.4%
SOx All Scopes = 4287 lbs

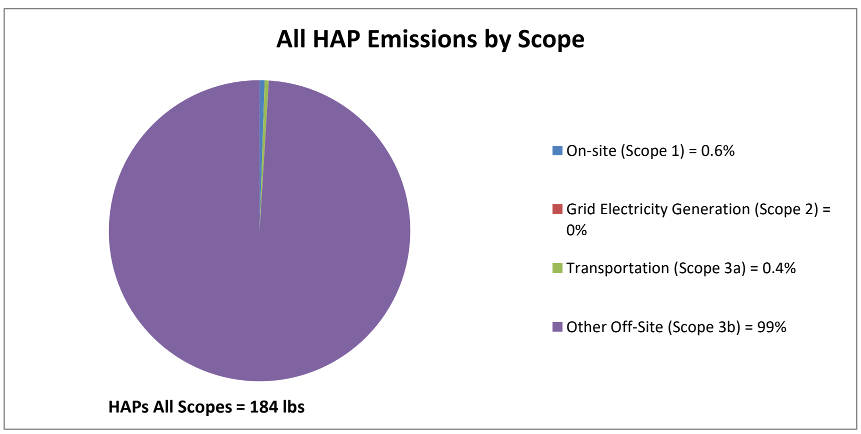

All PM Emissions by Remedy Component and Scope
(in Lbs)
7000
6000
5000
4000
3000
2000
1000
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term Monitoring...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 5924.1 lbs


All PM Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 99.5%
Groundwater Monitoring (Years 1-2) = 0.3%
Long Term Monitoring (Years 3-10) = 0.1%
Site Closeout = 0%
< Component 6 > = 0%
PM All Components = 5924.1 lbs


All PM Emissions by Scope
On-site (Scope 1) = 3.9%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 1.1%
Other Off-Site (Scope 3b) = 95%
PM All Scopes = 5924.1 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
180
160
140
120
100
80
60
40
20
0
Site Preparation
OU1 Plating Pond -...
Groundwater...
Long Term...
Site Closeout
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 184 lbs


All HAP Emissions by Remedy Component
Site Preparation = 0%
OU1 Plating Pond - Excavation and Disposal = 90.3%
Groundwater Monitoring (Years 1-2) = 7.6%
Long Term Monitoring (Years 3-10) = 2%
Site Closeout = 0.1%
< Component 6 > = 0%
HAPs All Components = 184 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0.6%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.4%
Other Off-Site (Scope 3b) = 99%
HAPs All Scopes = 184 lbs

ATTACHMENT 7

SEFA ANALYSIS OUTPUT – SUMMARY OF ALTERNATIVES

Spreadsheets for Environmental Footprint Analysis (SEFA) Version 3.0, November 2019
Former Air Force Plant 51 - OU1 Alternatives Comparison Table

Environmental Footprint Summary

Core Element	Metric	Unit of Measure	Total Footprint Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6A	Alternative 6B
Materials & Waste	Refined materials used on-site	Tons	353	353	207	129	737	737
	% of refined materials from recycled or reused material	%	1%	1%	2%	0%	0%	0%
	Unrefined materials used on-site	Tons	205	205	205	204	12,000	11,250
	% of unrefined materials from recycled or reused material	%	0%	0%	0%	0%	0%	0%
	On-site hazardous waste disposed of off-site	Tons	0	0	0	0	626	579
	On-site non-hazardous waste disposed of off-site	Tons	68	68	512	67	11,893	11,001
	Recycled or reused waste	Tons	0	0	0	0	0	0
	% of total potential waste recycled or reused	%	0%	0%	0%	0%	0%	0%
Water (used on-site)	Public water use	MG	0.70	0.70	0.70	0.00	0.00	0.00
	Groundwater use	MG	0.00	0.00	0.00	0.00	0.00	0.00
	Surface water use	MG	0.00	0.00	0.00	0.00	0.00	0.00
	Reclaimed water use	MG	0.00	0.00	0.00	0.00	0.00	0.00
	Storm water use	MG	0.00	0.00	0.00	0.00	0.00	0.00
	Wastewater generated	MG	0.00	0.00	0.00	0.00	0.00	0.00
Energy	Total energy used (on-site and off-site)	MMBtu	64,300	68,504	65,527	79,852	16,643	16,232
	Energy voluntarily derived from renewable resources							
	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0	0	0	0	0	0
	Voluntary purchase of renewable electricity	MWh	0	0	0	0	0	0
	Voluntary purchase of RECs	MWh	0	0	0	0	0	0
	On-site grid electricity use	MWh	2,451	2,451	2,451	3,800	0	0
Air	On-site NOx, SOx, and PM emissions	Pounds	293	314	890	160	2,969	2,969
	On-site HAP emissions	Pounds	0	0	0	0	1	1
	Total NOx, SOx, and PM emissions	Pounds	23,073	25,639	25,219	28,690	21,472	20,573
	Total NOx emissions	Pounds	7,580	8,599	8,638	9,594	10,764	10,362
	Total SOx emissions	Pounds	14,489	15,855	15,245	18,011	4,397	4,287
	Total PM emissions	Pounds	1,004	1,185	1,336	1,085	6,312	5,924
	Total HAP emissions	Pounds	988	1,040	993	1,040	187	184
	Total greenhouse gas emissions	Tons CO2e*	1,200	1,294	1,184	1,305	1,609	1,576

Notes
** Total greenhouse gases emissions (in CO2e) include CO2, CH4, and N2O (Nitrous oxide) emissions.*
MMBtu = millions of Btus
MG = millions of gallons
CO2e = carbon dioxide equivalents of global warming potential
MWh = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
Tons = short tons (2,000 pounds)
HAP = hazardous air pollutants
PM = particulate matter
NOx = nitrogen oxides
SOx = sulfur oxides
CO2 = carbon dioxide
CH4 = methane
N2O = nitrous oxide
The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012
Alternative 2 = Dual-Phase Extraction for Source Area and In-Situ Bioremediation
Alternative 3 = Dual-Phase Extraction for Source Area and In-Situ Chemical Oxidation
Alternative 4 = Dual-Phase Extraction for Source Area and Permeable Reactive Barrier
Alternative 5 = In-Situ Thermal Treatment
Alternative 6A = Source Area Excavation and Off-Site Disposal (Protection GW SCO)
Alternative 6B = Source Area Excavation and Off-Site Disposal (Commercial SCO)