Exhibit 4
GM-OU-4 Public Hearing
April 20, 2020

FOCUSED FEASIBILITY STUDY

FORMER WILMINGTON ASSEMBLY PLANT – DODSON AVE.
INTERIM VAPOR PHASE REMEDIATION

WILMINGTON, DELAWARE

Submitted to:

Site Investigation & Restoration Section
Division of Waste and Hazardous Substances
Department of Natural Resources &
Environmental Control
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On behalf of:

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INTERNAL QUALITY CONTROL SHEET

This Focused Feasibility Study has been prepared by BrightFields, Inc. following the Delaware Department of Natural Resources and Environmental Control (DNREC) practices and policies under the Hazardous Substance Cleanup Act (HSCA). This Report represents BrightFields' knowledge of conditions on the subject site at the time of preparation.

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1.0 INTRODUCTION

This Focused Feasibility Study (FFS) is prepared by BrightFields, Inc. (BrightFields) on behalf of the Revitalizing Auto Communities Environmental Response Trust (RACER Trust). This FFS is prepared as a proactive measure to address potential vapor intrusion issues related to a contaminant plume adjacent to the Anchor Motor Freight Building on the Former Wilmington Assembly Plant (Site). Figure 1 illustrates the location of the Site.

This FFS is developed to address soil vapors only and is not written to address soil or groundwater contamination. This study was conducted using data collected during several studies at the Site. BrightFields is currently completing a Vapor Intrusion and Groundwater Delineation Investigation Report which summarizes the results of investigations BrightFields has completed at the Site. Initial investigations at the Site were completed in accordance with a Delaware Department of Natural Resources and Environmental Control (DNREC) Site Investigation and Restoration Section (SIRS)-approved September 2012 Dodson Avenue Vapor Intrusion Investigation Work Plan prepared by Conestoga-Rovers & Associates (CRA). Subsequent investigations were completed to further define contamination at the Site; BrightFields collaborated with RACER Trust, DNREC-SIRS, and CRA to develop the scope of these investigations. The studies conducted at the Site have indicated that contaminated groundwater and soil are present and are impacting soil vapor quality. Volatile organic compounds (VOCs) in soil gas are migrating eastward from the source area and/or from the dissolved VOC groundwater plume. Soil gas concentrations decline as they migrate eastward off-site; however, they appear to be encroaching on townhome parcels directly adjacent to the property along Dodson Avenue. Currently it does not appear that soil vapors are affecting end point receptors.

1.1 Purpose and Organization of Report

This FFS is developed as a proactive measure to address potential vapor intrusion issues into nearby residential structures at the Site. This report was developed to evaluate remedial alternatives that can be implemented to quickly reduce or eliminate the risk associated with contaminated soil vapors. This report will evaluate remedial alternatives that can address soil vapors only. This study will not develop or evaluate long-term remedial strategies to address source contamination. The remedial alternatives developed in this study are not intended to serve as a final remedy for soil and groundwater contamination.Data collected in several studies at the Site are used as the basis for the analysis of remedial alternative. This report does not include a detailed summary of these investigations; these investigations will be summarized in the Vapor Intrusion and Groundwater Delineation Investigation Report.

This report is organized to follow the suggested FS report format outlined in Appendix C of the Delaware Hazardous Substance Cleanup Act (HSCA) Guidance Manual (1994), where appropriate. This FFS is being undertaken as a proactive measure to address potential migration of soil vapors at the site. Contaminant fate and transport and a baseline risk assessment were not completed for this FFS. Because remedial alternatives are only being developed to address soil vapor intrusion issues, screening of remedial alternatives is not required; only soil vapor extraction remedies are evaluated.

1.2 Background Information

1.2.1 Site Description

The Anchor Motor Freight Building at the Former Wilmington Assembly Plant is located in the southeast section of the plant along Dodson Avenue (see Figure 1). The impacted area of the Site is covered predominantly by asphalt and concrete. The area to the east of the plant property boundary is a residential development. The neighboring residential development includes duplex houses with basements located partially below grade. The area surrounding the residential houses includes soil with established vegetation (grass) and asphalt driveways.

1.2.2 Site History

The Former Wilmington Assembly Plant is approximately 142 acres consisting of two tax parcels, one 126.6 acre parcel with a 3-million square foot auto assembly plant, waste water treatment plant, and parking lots and one 15-acre undeveloped wooded lot. The surrounding use of the site is commercial and residential.

Historical research indicates that the main plant facility was constructed on the Site by General Motors in 1947 and that there were three major expansions of the facility in 1966, 1986, and 1996. General Motors Corporation operated the Assembly Plant until July 2009. They filed for bankruptcy in June 2009 and became known as Motors Liquidation Company (MLC). Fisker Automotive purchased the property from MLC in July 2010. In March 2011, the RACER Trust was formed as part of the bankruptcy settlement to clean up and promote redevelopment of former GM properties. In April 2014, Wanxiang Delaware acquired the property.

An April 9, 1990 letter from DNREC to General Motors stated that 12 Underground Storage Tanks (USTs) were removed from the property. Ten of those tanks were adjacent to the Anchor Motor Freight building. Additionally, one gasoline UST (GMGT-1) was removed from near the southeastern corner of the assembly plant and one waste oil tank (WW-1) was removed from the stormwater area. The USTs contained diesel (four tanks), gasoline (three tanks), heating oil (two tanks), waste oil (two tanks), and engine oil (one tank).

1.2.3 Nature and Extent of Contamination

The nature and extent of contamination at the site is currently being defined. This FFS is written as a proactive measure to reduce or eliminate the potential for contaminated soil vapors from beneath the Site to adversely impact air quality within the residential structures located on Dodson Avenue, along the eastern boundary of the Site. This FFS has been developed before all of the remedial investigations have been finalized. BrightFields is drafting a Vapor Intrusion and Groundwater Delineation Investigation Report that summarizes investigations conducted at the Site and describes the nature and extent of contamination at the Site. This FFS uses the data compiled to complete that investigation report to define the nature and extent of contamination.

The contaminated groundwater plume extends from the Anchor Motor Freight building towards the northeast across Dodson Avenue. Groundwater contamination includes several volatile organic compounds (VOCs) including 1,2,4-trimethylbenzene, benzene, ethylbenzene, toluene, and xylenes (BTEX). Groundwater contamination also includes semivolatile organic compounds (SVOCs) including naphthalene and 2-methylnaphthalene. Subsurface contaminated soil extends from the edge of the Anchor Motor Freight building to approximately the eastern edge of Dodson Avenue. Soil contamination also consists of VOCs including 1,2,4-trimethylbenzene, benzene, ethylbenzene, toluene, and xylenes.

Off-site contaminated soil vapors extend from the edge of the property to approximately 100 feet east of Dodson Avenue. Soil gas samples that were collected contain VOCs, including 1,2,4-trimethylbenzene, benzene, ethylbenzene, and xylenes. Figure 2 shows benzene concentrations in shallow soil gas. Figure 3 shows ethylbenzene concentrations in shallow soil gas. Figure 4 shows 1,2,4-trimethylbenzene concentrations in shallow soil gas.

1.2.4 Applicable Local, State and Federal Requirements

Applicable regulatory requirements are used as a guide in the development of remedial action objectives, to evaluate remedial alternatives, and to govern the implementation and operation of a selected remedial alternative. Applicable requirements are generally classified as either chemical-specific, location-specific or action-specific. Chemical-specific requirements set protective exposure levels for chemicals of concern. Location-specific requirements can restrict remedial actions based on the characteristics of the site, and include zoning restrictions. Action-specific requirements set restrictions based on the management of hazardous substances, pollutants, or contaminants.

The Occupational Safety and Health Act (OSHA) of 1970 was developed to ensure that workers would be guaranteed safe and healthy working provisions. OSHA 29 CFR 1910.120 provides specific requirements for working on hazardous waste and emergency response sites. This regulation requires that workers at this site be provided specialized training and personnel protection equipment (PPE) while working on the site. This regulation also requires specific monitoring requirements while working at the site. Specific requirements from the regulation must be detailed and addressed in a site specific health and safety plan (HASP) developed to cover work conducted at the Site.

Delaware Hazardous Waste Regulations provide for specific requirements for the characterization, tracking, and disposal of wastes. The applicable sections of these regulations are similar to sections of the Resource Conservation and Recovery Act (RCRA, also known as the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act). The Delaware Hazardous Waste Regulations, Part 261 set specific requirements for the identification and listing of specific hazardous wastes. Parts 262 and 268 provide specific provisions for the generators of hazardous waste and restrictions on disposal. These regulations require that any wastes generated at the site, including excavated soils, be properly characterized and handled properly.

The National Emission Standards for Hazardous Air Pollutants (NESHAPS, as defined by 40 CFR 61 and 40 CFR 63) set specific standards for emissions, including specific limitations, permitting, and monitoring and reporting requirements. Delaware's Regulations Governing Air Pollution provide similar standards for air pollution control in Delaware as the federal standards. Specifically, Section 1102 Permit, of Title 7 of Delaware Code, provides for specific permitting requirements, operations limits, and monitoring and reporting requirements for any equipment which has the potential to discharge air contaminants into the atmosphere. These regulations require that any soil vapor extraction system at the site be evaluated and, if required, permitted and operated according to set regulations. Delaware's Air Control Program has specific permitting requirements for soil vapor extraction systems and limits emissions from a remediation system to less than 2.4 pounds of VOCs per day.

1.3 Remedial Action Objectives

Remedial action objectives are developed to protect human health and the environment. The objectives are developed as qualitative and quantitative objectives and specify the contaminants and media of concern. Qualitative objectives are defined in general terms to define the ultimate goal of the remediation. Quantitative objective are more specific objectives developed to specify an acceptable performance standard usually based on a risk assessment or applicable requirements.

The remedial objectives are being developed to address VOCs in soil gas at the Site. The objectives are developed to mitigate or eliminate the potential for soil vapors to impact the residential houses to the east of Dodson Avenue. The remedial action objectives will include the following:

- Capture contaminated soil vapors and prevent the migration of vapors towards residential structures along Dodson Avenue;
- Implement an interim remedy that may be integrated into a final remedy to address Site contaminants in all media; and
- Prevent the migration of soil vapors into the sub-slabs of the residential houses (units 30, 32, 36, 38, 40, 42, 44, and 46) that would result in a risk exceeding a 1×10^{-5} cumulative cancer risk.

2.0 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

2.1 Introduction

The remedial alternatives to be evaluated will be limited to alternatives which address soil vapors specifically. This FFS is written to develop an interim action to prevent the migration of soil vapors from impacted areas into nearby residential structures. Because the remedial alternatives will be limited to soil vapor technologies only, a screening step of potential remedial measures is not required. The remedial action alternatives evaluated include: 1) a no action alternative, 2) a soil vapor extraction system, and 3) residential sub-slab vapor mitigation systems.

2.2 No Action Alternative

The no action alternative does not reduce the concentration of contamination or prevent the migration of contamination, but is included as a baseline for comparison to other alternatives. Based on the results of the vapor intrusion and groundwater delineation investigations, it does not appear that soil vapors are affecting end point receptors. The study does recommend further sampling of potential receptors and notes that soil gases appear to be migrating towards potential receptors. Although there is no definitive evidence that soil vapors are currently causing an unacceptable risk to the potential receptors, the vapors are migrating towards the receptors. The no action alternative does not meet the remedial action objective of capturing soil vapors and preventing the migration of contaminated soil vapors.

2.3 Soil Vapor Extraction System

Soil vapor extraction (SVE) systems are used for capturing soil vapors. A conceptual design of a SVE system to capture soil vapors migrating towards the residential structures along Dodson Avenue has been developed. The conceptual design includes a series of SVE recovery wells within the vapor migration pathway connected to a SVE extraction blower. A conceptual layout of the system is included as Figure 5.

Although there is no pilot test data to use in the conceptual design of the SVE system, soil boring logs are available and were used to identify soil characteristics at the Site that appear favorable for operation of an SVE system. Soil boring logs within the immediate vicinity of the proposed SVE wells that were reviewed include GP-02, GP-03, GP-07, MW-42, and MW-38 (these boring logs are included as Appendix A). The selected logs show that soil vapor concentrations (as measured in the field with a photoionization detector (PID)) are generally highest at depths ranging from 14 to 18 feet below ground surface (bgs). Soil vapor concentrations within the first two feet of soil in these borings are generally low. The soil characteristics of the samples logged from these borings vary significantly. More restrictive (less vapor permeable) soil, including silt and clay, are found within the upper layers (0 to 14 feet bgs) of these borings. Less restrictive (more vapor permeable) soil, including sands (medium and coarse) and gravel, are found in deeper layers (12 to 19 feet bgs) of these borings and these have the highest soil vapor concentrations. SVE wells screened within the more permeable zones (which have the higher soil vapor concentrations) would likely capture and remove contaminated soil vapors in this area. Limiting the SVE well screens to within or below the less restrictive soils with less permeable soil above would serve to limit the vertical movement of soil vapors and would likely increase the radius of influence of a SVE system.

The conceptual SVE system includes a 15-horsepower (hp) regenerative blower capable of extracting 295 standard cubic feet per minute (scfm) of vapor flow at 60-inches of water vacuum. The system will be connected to a catalytic oxidizer capable of treating the contaminated vapors to meet DNREC standards. The SVE extraction wells will be 20-foot deep, 2-inch diameter wells, screened from approximately 12 feet bgs to 20 feet bgs. The wells will be installed across the migration pathway between the Anchor Motor Freight building and the potential receptors and spaced approximately 50 feet apart.

Based on the soils within the SVE well screened area (predominantly sand, and sand and gravel) and the soils above the screened area (predominantly silt and clay), a radius of influence of greater than 30 feet is anticipated. This would mean that the radius of influence of each well would overlap the influence from the neighboring well and sufficiently interrupt the potential migration pathway. Once installed, a pilot test should be conducted to evaluate the SVE capabilities.

A properly designed and operated SVE system would capture migrating soil vapors. Depending on soil conditions and the final remedy selected to remediate Site soils, groundwater, and soil vapor, a SVE system used to capture contaminated soil vapors could be included as at least a portion of the final remedial alternative. The effective capture of contaminated soil vapors would reduce the risk associated with soil vapors and meet the remedial action objectives.

2.4 Sub-Slab Vapor Mitigation Systems

Sub-slab vapor mitigation systems installed into each residential structure could be used to prevent sub-slab soil vapors from migrating into the residential structure. These systems include a pipe installed below the slab, within the gravel sub-surface (sub-base), which is vented to the atmosphere. The piping allows for a preferential pathway venting between the sub-slab and the atmosphere that reduces the potential for sub-slab vapors to migrate into the residential structure.

Sub-slab vapor mitigation systems can be operated as passive systems, which include only the pipe from the sub-slab to the atmosphere, or operated as an active system, which includes a fan connected to the piping which increases flow between the sub-slab and the atmosphere. Both systems are installed to create a negative pressure differential between the sub-slab and the residential structure.

The flow and pressure differential from passive systems rely on winds and heat stack effects and can vary significantly. In structures where passive systems do not contribute to sufficient flow or pressure differential, fans are added to the piping to induce flow. For the purpose of this FFS, active systems using fans to induce sufficient flow from the sub-slab are considered. There are numerous fan designs which provide for a range of different flows and pressure differentials. A Radonaway RF145 fan should operate to induce a flow of approximately 126 scfm and produce 0.5-inches of water vacuum.

A sub-slab vapor mitigation system could be used to reduce the flow of sub-slab vapors into the residential structures; this would likely reduce the risk associated with soil vapors to meet the remedial action objectives. The sub-slab vapor mitigation systems could be part of the final remedy to address soil vapors at the Site, but would likely not contribute to soil or groundwater remediation. The sub-slab vapor mitigation systems can create a pressure differential from the source area to the residential structures. However, the pressure differential created by these systems would generate a very low volume, and a sub-slab vapor mitigation system may not meet the remedial objective of preventing the migration of vapors towards the residential structures.

3.0 DETAILED ANALYSIS OF ALTERNATIVES

3.1 Introduction

The detailed analysis of alternatives is conducted to evaluate the identified alternatives and present relative advantages and disadvantages of the alternatives. The analysis is conducting by evaluating the alternatives against specific criteria used to aid in the selection of the preferred remedy. The criteria by which the alternatives are evaluated are:

Overall Protection of Public Health, Welfare, and the Environment evaluates how the alternative meets cleanup levels. This criterion describes how the alternative achieves and maintains protections of human health and the environment. This criterion will be evaluated as a comparison of the remedial action objectives.

Compliance with Laws and Regulations is an evaluation of how the alternative will meet Federal, State, and local regulations. This criterion also evaluates how other applicable guidance will be met. This criterion will be evaluated against the applicable regulations identified in Section 1.2.4 of this report.

Community Acceptance considers the desired use of the property after remediation and public concerns about the remediation.

Compliance Monitoring Requirements consider the ability to monitor the success of the remediation. This criterion must consider exposure pathways that cannot be monitored and the consequences of a failed remedy.

Permanence considers the overall effectiveness of the remedial alternative. In evaluating permanence, the amount of contamination destroyed and treated during remediation and the residual remaining contamination is also considered. This criterion considers the degree at which the remediation is irreversible.

Technical Practicability evaluates the technical feasibility of alternative and the availability of the technology. This criterion considers how likely the technology will meet performance standards, as well as the ease of undertaking the remediation. This criterion also considers the reliability of the alternative and whether the necessary equipment, specification and knowledgeable specialist are readily available to implement the technology.

Restoration Timeframe considers the time until primary and secondary threats are addressed and the time until the remedial action objectives are met.

Reduction of Toxicity, Mobility and Volume of Contamination is a criterion that is used to evaluate how well the alternative mitigates the risk at the site. This evaluation criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element.

Long-term Effectiveness evaluates the effectiveness of the alternative in terms of the risk associated with contamination remaining after the alternative is implemented. This criterion also evaluates the degree of long-term management that is required after the alternative is implemented. As the alternatives developed for this interim action are developed to reduce risk associated with the migration of soil vapors and not to remediate the site, the extent at which the remedial alternative can be incorporated into a final remedy at the site will be examined.

Short-term Effectiveness evaluates the effectiveness of the alternative at protecting the community and workers during the implementation. This criterion also considers environmental impacts expected during the implementation of the remedy.

Cost is used as an evaluation criterion to establish a preference when alternatives equally satisfy the above criteria. Generally, capital cost and operations and maintenance costs are considered in the evaluation.

3.2 No Action Alternative

The no action alternative is evaluated as a baseline to compare all other remedial alternatives. Although the current risk assessment does not indicate that an unacceptable risk associated with the soil vapors exists, the soil vapors are migrating towards potential receptors and may pose a significant risk in the future. The no action alternative would not prevent the migration of soil vapors to potential receptors nor meet any of the remedial action alternatives.

Overall Protection of Public Health, Welfare, and the Environment The no action alternative would not prevent the migration of soil vapors to potential receptors. This alternative does not reduce the risk associated with contaminated soil vapors. The no action alternative does not meet any of the remedial action objectives.

Compliance with Laws and Regulations The no action alternative would likely lead to an unacceptable risk associated with contaminant concentrations within residential structures.

Community Acceptance Nearby structures are used as residential properties. The no action alternative may lead to soil vapor intrusion into the residences above acceptable risk levels. It is not expected that this alternative would be acceptable to the community.

Compliance Monitoring Requirements The no action alternative would require frequent routine monitoring of sub-slab and indoor air concentrations of contaminants of concern.

Permanence The no action alternative does not provide for the destruction of any contaminants and is not a permanent remedy.

Technical Practicability The no action alternative is easily implemented from a technical standpoint, but cannot meet the performance standards.

Restoration Timeframe The no action alternative will not address threats associated with soil vapors. This alternative does not meet the remedial action objectives at the Site.

Reduction of Toxicity, Mobility and Volume of Contamination The no action alternative will not reduce the toxicity, mobility, or volume of contamination at the Site.

Long-term Effectiveness The no action alternative does not meet the remedial action objectives for the Site. There is no long-term effectiveness associated with this remedy.

Short-term Effectiveness The no action alternative does not require implementation, therefore there is no additional risk to the community and workers associated with the implementation.

3.3 Soil Vapor Extraction System

The SVE system would be used to capture soil vapors below grade, prior to their migration to nearby receptors. The SVE system would likely pull back contaminated soil vapors from the nearby residential properties. The system will reduce soil vapor concentrations at the Site and could be used as, or integrated in to, a remedial strategy to address soil vapor, soil, and groundwater contamination at the Site.

Overall Protection of Public Health, Welfare, and the Environment The soil vapor extraction system alternative would capture soil vapors and prevent the migration of soil vapors to the nearby receptors. The SVE system would prevent soil vapor concentrations in the sub-slab from increasing to levels above risk based criteria. The SVE system could be integrated into a final remedy to address contamination of all impacted media. This alternative is protective of human health and the environment.

Compliance with Laws and Regulations The soil vapor extraction system alternative would require that excavated soils, from pipe trenches and extraction wells, be properly characterized and disposed. All work would be conducted following an approved site specific health and safety plan to meet OSHA requirements.

Extracted soil vapors would be treated by a catalytic oxidizer. The catalytic oxidizer destroys contaminants in extracted air as they pass through the oxidizer; the destruction efficiency is up to 99.5%. The catalytic oxidizer is equipped with a manual and an automated dilution valve which can limit contaminant loading to the oxidizer. Emissions from the system are easily controlled to meet regulatory emissions limits. The SVE system can be implemented in compliance with applicable laws and regulations.

Community Acceptance The soil vapor extraction system alternative is developed to reduce or eliminate the risk associated with soil vapors in nearby residences. Implementation of the remedy will allow for continued future use of the residences and would be expected to be acceptable to the community.

This alternative would require that wells be installed in or near Dodson Avenue, and that soils be excavated from a trench running from the wells to the Anchor Motor Freight building. Potential impacts from the implementation of this alternative include air emissions, noise, and traffic. Engineering controls can be employed to effectively mitigate these impacts.

Compliance Monitoring Requirements The soil vapor extraction system alternative would require monitoring during excavation to ensure contaminant concentrations in the air are below action levels. The system would be monitored and sampled on a routine basis to ensure the system is capturing contaminants and is effectively destroying the contaminants to meet emissions limits.

Permanence The soil vapor extraction system alternative would be effective in capturing and controlling soil vapors. Although the system is designed as an interim measure, the SVE system could be an effective measure for remediating the source area and ultimately reducing contaminants at the site.

Technical Practicability Soil vapor extraction is technically practical but will require that a pilot test be conducted after installation to ensure effective capture of the migrating soil vapors. Should the pilot test show that soil vapors are not being fully captured, the system can be easily expanded by installing additional extraction wells. SVE systems are readily available and are proven effective at remediating volatile soil vapor contaminants.

Restoration Timeframe The soil vapor extraction system alternative would allow for the effective capture of soil vapors almost immediately after the alternative is implemented. This alternative will take approximately ten weeks to install and test. This alternative can be incorporated into a component of a permanent remedial alternative, to address all media, at any time.

Reduction of Toxicity, Mobility and Volume of Contamination The soil vapor extraction system alternative will remove soil vapors from the subsurface and effectively reduce the volume of contaminant concentration. The system can remove up to 300 scfm of soil vapors and is designed to effectively destroy the contaminants, thereby reducing toxicity.

Long-term Effectiveness The soil vapor extraction system alternative is effective at capturing volatile contaminants from soil vapor reducing the risk associated with the vapors. SVE can be effective in remediating source concentrations if effectively installed and operated. Until a permanent alternative to address all media is developed, the long-term effectiveness of the SVE alternative cannot be fully evaluated.

Short-term Effectiveness The soil vapor extraction system alternative can be installed with controls that reduce the risk associated with implementation. Air emissions will be monitored and can be controlled if necessary. Traffic impacts associated with the implementation can be minimized. A health and safety plan will be developed prior to implementation of this remedy that will effectively identify risks associated with the implementation and detail steps to mitigate these risks. The system can be installed away from nearby residences in an effort to minimize noise impacts during operations.

3.4 Sub-Slab Vapor Mitigation Systems

Sub-slab vapor mitigation systems may be used to control soil vapors immediately below foundation slabs of townhouse units 30, 32, 36, 38, 40, 42, 44, and 46. The sub-slab vapor mitigation systems create a preferential pathway between the vapors below the slab and the atmosphere. This can be accomplished with both passive and active systems. The systems create a pressure differential between the sub-slab environment and the interior of the residence to effectively reduce vapor intrusion in to the residence. Individual systems must be installed in each structure to reduce the potential for vapor intrusion.

Overall Protection of Public Health, Welfare, and the Environment The sub-slab vapor mitigation systems alternative would reduce the risk associated with vapor intrusion to nearby receptors. This alternative would not be effective in attaining cleanup levels at the Site, but would be an effective temporary measure to protect human health and the environment.

This alternative will reduce the potential for vapor intrusion into the residential structures on Dodson Avenue and could be a part of a final remedial measure. This alternative, however, does not meet the remedial action objective of preventing the migration of soil vapors towards the residential structures. Although the systems create a minor pressure differential in the sib-slab environment, this pressure differential will either have no impact on soil vapor migration or will serve to increase soil vapor migration towards the potential receptors.

Compliance with Laws and Regulations The sub-slab vapor mitigation systems alternative is easily implemented in compliance with applicable regulations. Based on a preliminary review of soil vapor concentrations and the performance data of the proposed fans, the systems would not require a permit for emissions. Emissions estimates are significantly below the threshold that requires that the systems be registered with DNREC. These systems can be installed without permit or registration. Emissions estimates are included as Appendix B.

Community Acceptance The sub-slab vapor mitigation systems alternative is developed to reduce or eliminate the risk associated with soil vapor intrusion into nearby residential structures. Implementation of the remedy will allow for continued future use of the residences. During the installation of these units, noise will be generated as the slab is cut; the noise impacts will be short lived. Installers will also be required to enter residential structures to install the units. Periodic monitoring of the systems is also required, but can be accomplished outside of the residence.

Compliance Monitoring Requirements The sub-slab vapor mitigation systems alternative would require monitoring during installation to ensure contaminant concentrations in the air are below action levels. The system would be monitored and sampled on a routine basis to ensure the system is capturing contaminants by maintaining a positive differential pressure between the interior of the structure and the sub-slab environment.

Permanence The Sub-slab vapor mitigation systems alternative would be effective in controlling soil vapor intrusion into residences. The systems are not designed to remediate soil vapors and would have no impact on the overall remediation of the Site. This alternative would not destroy or otherwise reduce any contaminant levels other than venting them to the atmosphere.

Technical Practicability Sub-slab vapor intrusion systems are effective in preventing vapor intrusion into structures. Some systems must be active (flow induced by a fan) to maintain the proper pressure differential. These systems are readily available and can be installed easily.

Restoration Timeframe The sub-slab vapor mitigation systems alternative would be employed as a protective measure to prevent vapor intrusion only. These systems are not designed to effectively remediate the Site. The systems will be immediately effective at reducing the risk associated with vapor intrusion once implemented. This alternative will take approximately two weeks to install and test.

Reduction of Toxicity, Mobility and Volume of Contamination The sub-slab vapor mitigation systems alternative will reduces the risk associated with vapor intrusion inside the structures. These systems do not reduce toxicity, mobility, or volume of contaminants other than venting them to the atmosphere.

Long-term Effectiveness The sub-slab vapor mitigation systems alternative would be implemented to reduce the risk with vapor intrusion only, and is not a long-term remedial measure.

Short-term Effectiveness The sub-slab vapor mitigation systems alternative can be installed to immediately reduce the risk associated with vapor intrusion. During installation air emissions will be monitored and can be controlled if necessary.

3.5 Comparative Analysis of Alternatives

3.5.1 Overall Protection of Public Health, Welfare, and the Environment

The no action alternative is not protective of human health and the environment. The sub-slab vapor mitigation alternative will protect human health and the environment but does not meet all remedial action goals. This alternative does not prevent the migration of soil vapors towards the nearby receptors. The SVE alternative is protective of human health and the environment and can successfully meet all remedial action goals.

3.5.2 Compliance with Laws and Regulations

Each of the three alternatives can be implemented within the requirements of applicable regulations. The no action alternative may allow soil vapor intrusion to impact the quality of indoor air, requiring further action.

3.5.3 Community Acceptance

Each of the alternatives can be implemented with minimal impact on the community. The no action alternative would not address the risk associated with vapor intrusion into nearby houses and is not acceptable.

3.5.4 Compliance Monitoring Requirements

All three alternatives would require routine air monitoring. The no action alternative would require routine monitoring of the sub-slab environment and possibly indoor air monitoring. The SVE alternative would require routine monitoring of the system effluent during operations. The sub-slab vapor mitigation system would require effluent monitoring after start-up, and routine pressure differential monitoring throughout the life of the remediation.

3.5.5 Permanence

The no action and sub-slab vapor mitigation systems are not effective remedial options. Neither option results in the destruction of contaminants. The SVE alternative results in destruction of captured soil vapors and may become part of a successful remedial effort to address all media.

3.5.6 Technical Practicability

Each of the three alternatives is technically feasible. None of the approaches provide any significant technical barrier for implementation. The no action alternative does not provide an effective technical solution to meet the remedial action objectives. The sub-slab vapor mitigation system would be effective at reducing the risk associated with vapor intrusion. The SVE alternative would be effective at reducing the risk associated with soil vapors and would meet all remedial action objectives.

3.5.7 Restoration Timeframe

The no action alternative does not address principal threats associated with soil vapors. The sub-slab vapor mitigation system can be implemented within a few weeks and is immediately effective in reducing risk. The SVE alternative can be implemented in approximately ten weeks and will be immediately effective in reducing risk.

3.5.8 Reduction of Toxicity, Mobility and Volume of Contamination

The no action and sub-slab vapor mitigation alternatives do not reduce the toxicity, mobility or the volume of contamination. The SVE alternative will reduce toxicity, mobility and the volume of contamination.

3.5.9 Long-term Effectiveness

There is no positive long-term effect attributed to the no action alternative. The sub-slab vapor intrusion alternative is effective at reducing the risk associated with vapor intrusion, but provides no long-term effect. The SVE alternative may be an effective measure to address contamination at the Site.

3.5.10 Short-term Effectiveness

There are no significant short-term impacts associated with the implementation of any of the alternatives. Implementation of the sub-slab vapor mitigation and SVE alternatives will require some level of effort to monitor and reduce impacts to the community and workers.

3.5.11 Cost

Installation and operations and maintenance costs for the two alternatives were developed as a comparative measure of these alternatives. Because this feasibility study was undertaken to identify an interim measure and not a final remedial alternative, these preliminary estimates (included as Appendix C) include only installation and operations and maintenance costs and do not include a present value lifecycle cost estimate. The soil vapor extraction system would include the addition of six new extraction wells with below grade piping to the SVE system. The system would include an extraction blower and a catalytic oxidizer to treat soil vapors prior to discharge to the atmosphere. The SVE system can be purchased and installed for approximately $242,000. Operations and maintenance costs for the SVE system include visits to monitor system performance every two weeks and compliance sampling of the catalytic oxidizer effluent. The compliance sampling would be limited to influent and effluent grab samples only. Annual operations and maintenance costs for the SVE system are approximately $88,000.

The sub-slab vapor mitigation systems would be installed in eight nearby townhouses. The systems would each include piping installed below the basement slab extended to above the roofline. An extraction fan would be installed on the piping run. The eight systems can be purchased and installed for a total cost of approximately $27,000. Operations and maintenance costs for the sub-slab systems include visits to monitor system performance every quarter and compliance sampling of the effluent from each of the eight fans. In addition, annual sub-slab and townhouse interior air quality monitoring is included. The annual monitoring would include the collection of 20 samples (8 sub-slab, 8 home interior, 2 duplicate and 2 ambient air samples) over a 24-hour period into Summa® canisters for laboratory analysis. Annual operations and maintenance costs for the sub-slab vapor mitigation systems are approximately $44,000.

4.0 PREFERRED ALTERNATIVE AND JUSTIFICATION

The SVE alternative is the preferred alternative to reduce the risk associated with soil vapors at the Site. The SVE alternative is the only alternative that addresses all remedial action objectives. The SVE alternative also addresses all evaluation criteria, except long-term effectiveness, completely. The SVE alternative is the only alternative that has the potential to address long-term effectiveness criterion in an effective manner either in conjunction with an expanded remedial effort or operating by itself (additional study is required). The statutory preference for selecting a remedial alternative which employs treatment that permanently and significantly reduces toxicity, mobility or volume of the hazardous contaminant as a principle element is only addressed by selecting the SVE alternative.

The sub-slab vapor mitigation systems alternative does not address all remedial action objectives and does not successfully meet all evaluation criteria. The sub-slab vapor mitigation systems have the ability to immediately reduce or eliminate the risk associated vapor intrusion. The sub-slab vapor mitigation systems could be considered as an additional measure to reduce the risk associated with soil vapors if concentrations in soil vapors in the sub-slab areas exceed acceptable risk criteria.

5.0 RECOMMENDATIONS

Based on the evaluation of the alternatives, it is recommended that a soil vapor extraction system be installed as an interim measure to address potential vapor intrusion issues related to the contaminant plume. This interim measure is not intended to be a final remedy for groundwater and soil vapor contamination at the site.

BrightFields recommends that the contamination at the Anchor Motor Freight Building be addressed as a separate operable unit and that a remedial investigation be completed to fully characterize the contamination. Once the contamination is more fully characterized, BrightFields recommends that a feasibility study be conducted to evaluate alternatives to address the contamination in this operable unit as required.

6.0 REFERENCES

BrightFields, Inc. (BrightFields), 2013b, Dodson Avenue Vapor Intrusion Investigation Work Plan – Former Wilmington Assembly Plan, August 2013.

BrightFields, 2013a, Dodson Avenue Vapor Intrusion Investigation Work Plan – Phase II – Former Wilmington Assembly Plant, January 2013.

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BrightFields, 2014, Draft Vapor Intrusion and Groundwater Delineation Investigation Report, May 2014.

Delaware Department of Natural Resources and Environmental Control – Site Investigation and Restoration Section (DNREC-SIRS), 2014, Screening Level Table, January, 2014.

DNREC, 2012, Delaware Hazardous Substance Cleanup Act, 7 Del. C. Part IX Chapter 91, Subchapter II Brownfields Development Program, July 2012.

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DNREC, 1995, Voluntary Cleanup Program Guidance Manual, February 1995.

DNREC, 1994, Hazardous Substance Cleanup Act Guidance Manual, October 1994.

Interstate Technology and Regulatory Council (ITRC), 2007, Vapor Intrusion Pathway: A Practical Guideline, January 2007.

U.S. Environmental Protection Agency (USEPA), 1988, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, October 1988.

PA
Site Location
DE
MD
NJ
Reybold Self Storage
LAURA CT
CHAMPLAIN AV
Former Wilmington Assembly Plant Buildings
Anchor Motor Freight Building
44
46
40
42
36
38
32
30
S LAURA CT
READ AV
Not Constructed
Not Constructed
Not Constructed
Not Constructed
Not Constructed
DODSON AV
BOXWOOD RD
AUGUSTINE ST
BECKER CT
ROCHELLE PL
CURTIS AV
Former Wilmington Assembly Plant Property (DE-1149)
Dodson Avenue Townhomes (With Unit Numbers)
Tax Parcels
Source: DEMAC - Aerial 2013; Delaware DataMIL - Tax Parcels.
Path: N:\Aerials and maps\Working GIS Files (Do Not Edit)\21 Phase II\2734.03.21 - Dodson Ave\MXD\FFS\Fig1SiteMap.mxd
BrightFields, Inc.
Environmental Evaluation
Investigation, and Remediation
801 Industrial Street, Suite 1
Wilmington, Delaware 19801
302-656-9600
302-656-9700 fax
Site Map
Former Wilmington Assembly Plant –
Dodson Ave. Off-Site Investigation
Wilmington, DE
By
Date
Drawn
ADS
4/11/2014
Checked
KLH
4/11/2014
Project #
2734.03.21
Scale:
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File Name:
Fig1SiteMap.mxd
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Figure 1
0
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- Previous Soil Gas Sample Locations (Shallow)
- Soil Gas Sample Locations (Shallow)
- Benzene Soil Gas Concentration Contour Exceeds EPA RSL of 3.1 ug/m^3
- Excavation-style GPR Anomalies
- Approximate Former Tank Area
- Former Wilmington Assembly Plant Property (DE-1149)
- 44 Dodson Avenue Townhomes (With Unit Numbers)

Note:
Bold exceeds EPA RSL for Benzene = 3.1 ug/m^3

Source: Delaware DataMIL - Aerial 2013;
New Castle County Office of Administrative Services - GIS and Mapping Services.

BrightFields, Inc.
Environmental Evaluation
Investigation, and Remediation
801 Industrial Street, Suite 1
Wilmington, Delaware 19801
302-656-9600
302-656-9700 fax

Benzene Concentration Distribution September 2013 (Shallow Soil Gas)
Former Wilmington Assembly Plant – Dodson Ave. Off-Site Investigation
Wilmington, DE

	By	Date	Scale:	File Name:
Drawn	ADS	7/14/2014	1:1,200	Fig2Benz_ConcShallow.mxd
Checked	JEH	7/14/2014	Fig. No.	
Project #	2734.03.21		Figure 2	

0 50 100 Feet

N W E S

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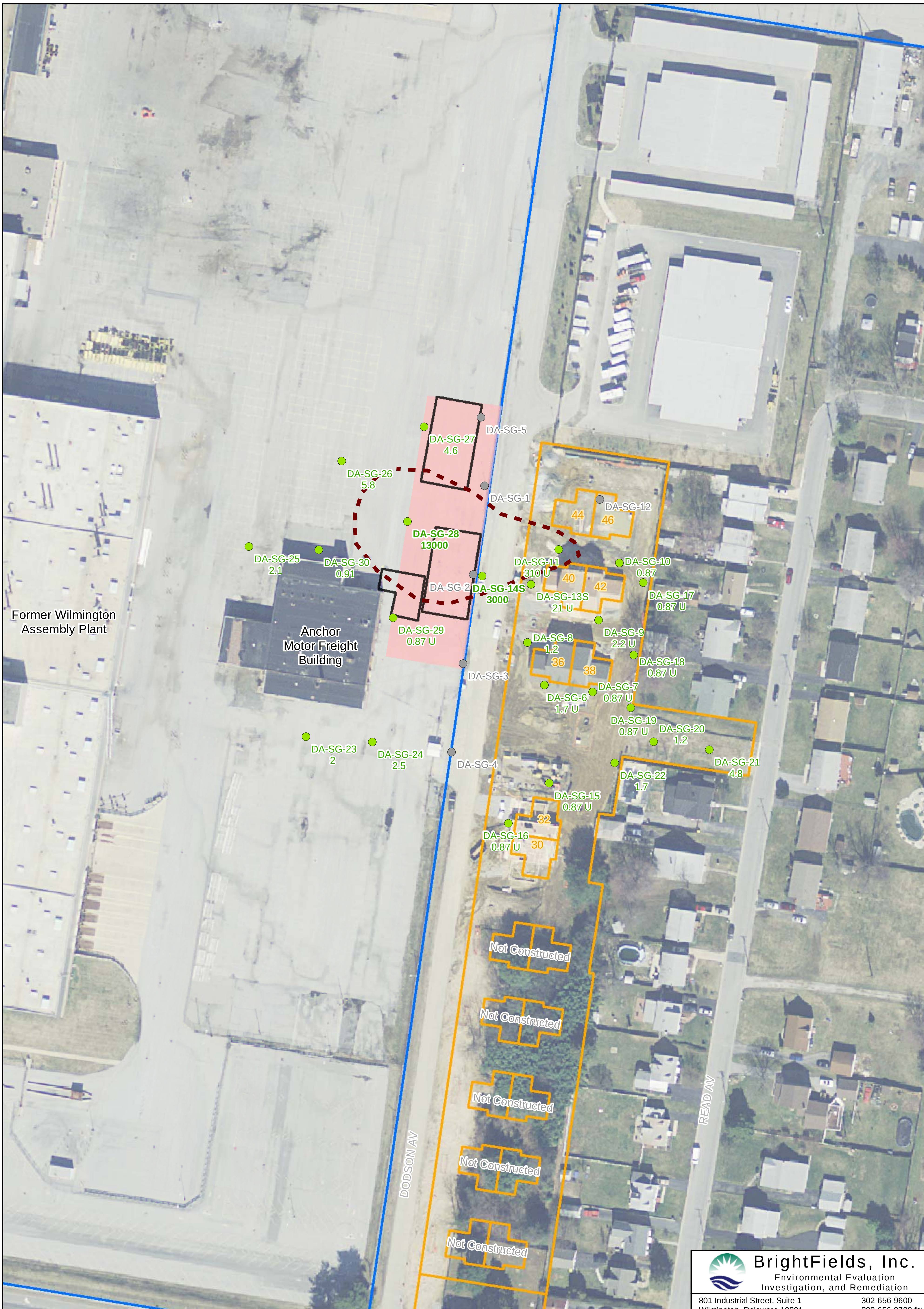

Previous Soil Gas Sample Locations (Shallow)
Soil Gas Sample Locations (Shallow)
Ethylbenzene Soil Gas Concentration Contour Exceeds EPA RSL of 9.7 ug/m^3
Excavation-style GPR Anomalies
Approximate Former Tank Area
Former Wilmington Assembly Plant Property (DE-1149)
44 Dodson Avenue Townhomes (With Unit Numbers)

Note:
Bold exceeds EPA RSL for Ethylbenzene = 9.7 ug/m^3

Source: Delaware DataMIL - Aerial 2012;
New Castle County Office of Administrative Services - GIS and Mapping Services.

BrightFields, Inc.
Environmental Evaluation
Investigation, and Remediation

801 Industrial Street, Suite 1
Wilmington, Delaware 19801
302-656-9600
302-656-9700 fax

Ethylbenzene Concentration
Distribution September 2013
(Shallow Soil Gas)
Former Wilmington Assembly Plant –
Dodson Ave. Off-Site Investigation
Wilmington, DE

	By	Date	Scale:	File Name:
Drawn	ADS	7/14/2014	1:1,200	Fig3ETHBenz_Shallow.mxd
Checked	JEH	7/14/2014	Fig. No.	
Project #	2734.03.21		Figure 3	

0 50 100 Feet

N W E S

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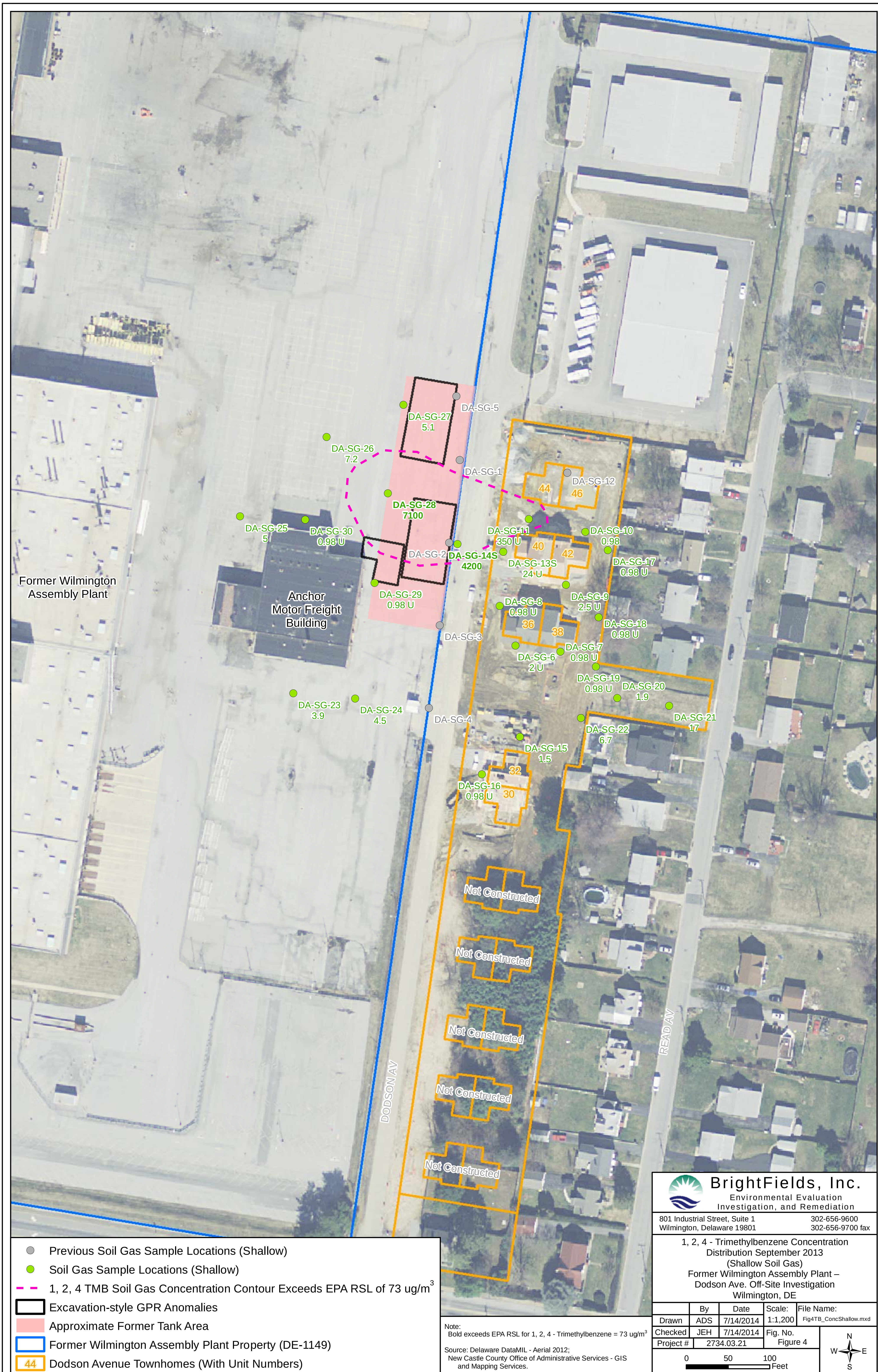

Former Wilmington Assembly Plant
Anchor Motor Freight Building
DODSON AV
READ AV
DA-SG-5
DA-SG-1
DA-SG-2
DA-SG-3
DA-SG-4
DA-SG-12
DA-SG-27 5.1
DA-SG-26 7.2
DA-SG-28 7100
DA-SG-25 5
DA-SG-30 0.98 U
DA-SG-29 0.98 U
DA-SG-14S 4200
DA-SG-11 350 U
DA-SG-13S 24 U
DA-SG-10 0.98
DA-SG-17 0.98 U
DA-SG-9 2.5 U
DA-SG-8 0.98 U
DA-SG-18 0.98 U
DA-SG-7 0.98 U
DA-SG-6 2 U
DA-SG-19 0.98 U
DA-SG-20 1.9
DA-SG-21 17
DA-SG-22 6.7
DA-SG-23 3.9
DA-SG-24 4.5
DA-SG-15 1.5
DA-SG-16 0.98 U
44
46
40
42
36
38
32
30
Not Constructed
Not Constructed
Not Constructed
Not Constructed
Not Constructed
Previous Soil Gas Sample Locations (Shallow)
Soil Gas Sample Locations (Shallow)
1, 2, 4 TMB Soil Gas Concentration Contour Exceeds EPA RSL of 73 ug/m3
Excavation-style GPR Anomalies
Approximate Former Tank Area
Former Wilmington Assembly Plant Property (DE-1149)
44 Dodson Avenue Townhomes (With Unit Numbers)
Note:
Bold exceeds EPA RSL for 1, 2, 4 - Trimethylbenzene = 73 ug/m3
Source: Delaware DataMIL - Aerial 2012;
New Castle County Office of Administrative Services - GIS and Mapping Services.
BrightFields, Inc.
Environmental Evaluation
Investigation, and Remediation
801 Industrial Street, Suite 1
Wilmington, Delaware 19801
302-656-9600
302-656-9700 fax
1, 2, 4 - Trimethylbenzene Concentration Distribution September 2013 (Shallow Soil Gas)
Former Wilmington Assembly Plant – Dodson Ave. Off-Site Investigation
Wilmington, DE
By Date
Drawn ADS 7/14/2014
Checked JEH 7/14/2014
Project # 2734.03.21
Scale: 1:1,200
File Name: Fig4TB_ConcShallow.mxd
Fig. No. Figure 4
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N W E S
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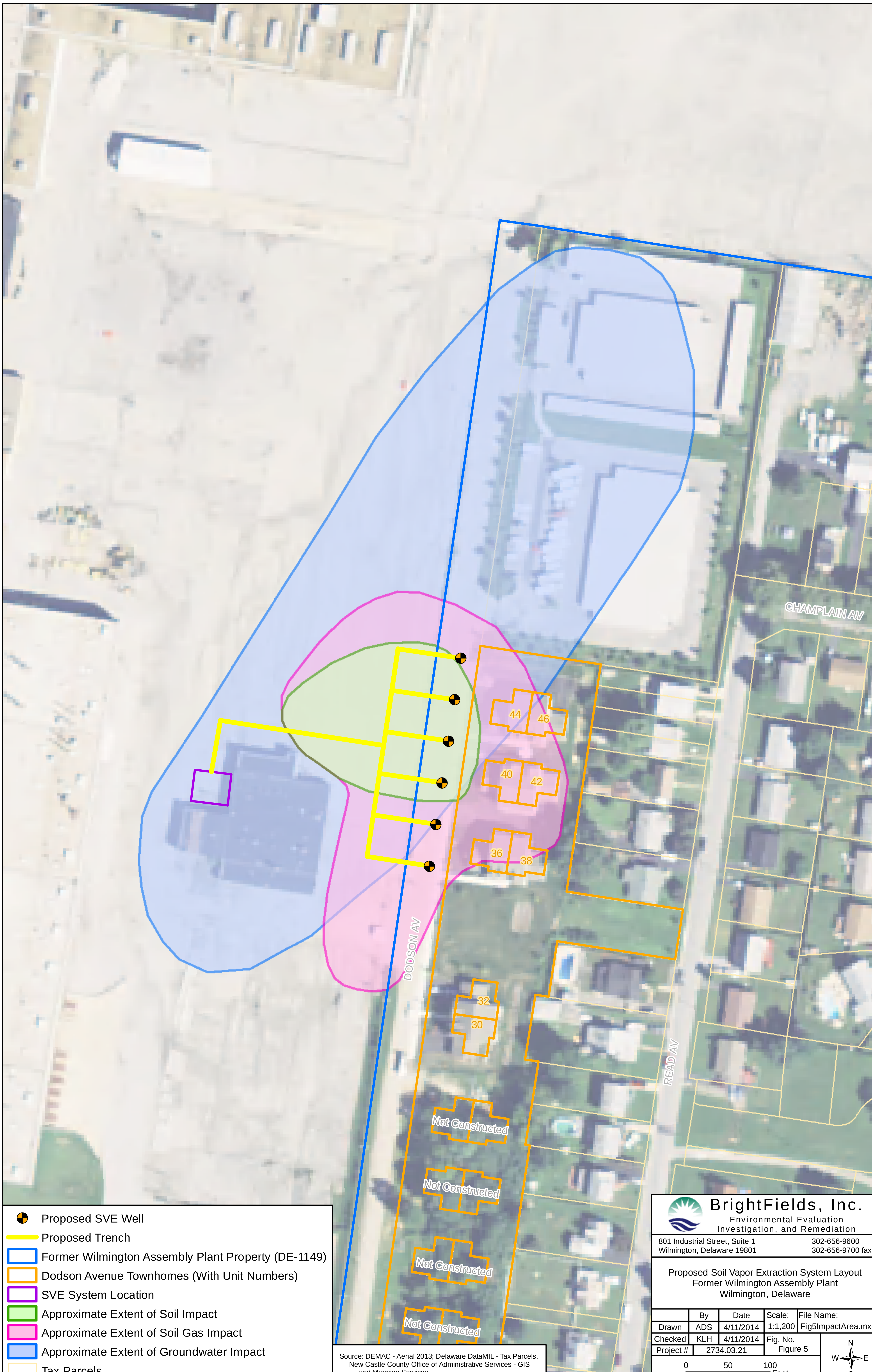

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APPENDICES

APPENDIX A

SELECT SOIL BORING LOGS

BrightFields, Inc.
Environmental Services
801 Industrial St. Wilmington, DE (302) 656-9600

GEOPROBE® DRILLING LOG
BORING ID: GP-02

Project Name: Dodson Vapor Intrusion Investigation
Location: Dodson Ave.
Weather Conditions: Mid 40s, overcast
Drilling Method: Geoprobe®
Sample Interval (feet): Continuous
Driller: Rob McAllister

Project No.: 2734.02.21
Drilling Date(s): 2/26/13
Drilling Contractor: Northeast Regional Probing, Inc.
Type of Sample/Coring Device: Dual Core
Depth Groundwater Encountered (feet, bgs): 18.2
Logged By: Michael Oakley

Time	Plastic Sample Tube Depth From	Plastic Sample Tube Depth To	Core Recovery (feet)	Depth (feet)	PID Reading (ppm)	Moisture	Soil Class	Soil Description
9:45	0	4	2.4	0.0-0.4	0.0	Dry	Fill	Crush and run, asphalt
				0.4-2.4	0.3	Dry	M Sand	Light brownish-orange sand (select fill)
	4	8	3	4.0-5.1	0.7	Dry		Light brown sand (select fill)
				5.1-5.9	72.1	Moist	Silt & Clay	Dark brown silt and clay, slight petroleum odor
	8	12	4.0	8.0-10.9	48.9	Moist	Clay	Light brownish-red, light gray striated clay with some silt
				10.9-12.0	74.9	Moist	Silt	Light brown silt, little sand and clay, trace gravel
	12	16	3.1	12.0-12.7	75.0	Moist	C Sand	Light brownish-red coarse sand, some gravel
				12.7-14.4	600	Moist		Light brownish-red coarse sand, some gravel
				14.4-15.1	80.0	Moist	M Sand	Light gray sand, little gravel
	16	20	4.0	16.0-16.8	20.9	Moist		Light and dark brownish-red sand, some silt and gravel
				16.8-18.2	26.9	Moist		Light brownish-red sand, some silt
				18.2-19.1	72.4	Wet		Dark brown sand, some silt
				19.1-20.0	72.8	Wet	Sand & Gravel	Light brown sand and large coarse gravel

GPS Coordinates:	X= 602381.05	Y= 629224.11		
Sampling Data:	Boring not sampled.			

Modifiers:
and: 35% to 50 %
some: 20% to 35%
little: 10% to 20%
trace: <10%

BrightFields, Inc.
Environmental Services
801 Industrial St. Wilmington, DE (302) 656-9600

GEOPROBE® DRILLING LOG
BORING ID: GP-03

Project Name: Dodson Vapor Intrusion Investigation
Location: Dodson Ave.
Weather Conditions: Mid 40s, overcast
Drilling Method: Geoprobe®
Sample Interval (feet): Continuous
Driller: Rob McAllister

Project No.: 2734.02.21
Drilling Date(s): 2/26/13
Drilling Contractor: Northeast Regional Probing, Inc.
Type of Sample/Coring Device: Dual Core
Depth Groundwater Encountered (feet, bgs): 16
Logged By: Michael Oakley

Time	Plastic Sample Tube Depth		Core Recovery (feet)	Depth (feet)	PID Reading (ppm)	Moisture	Soil Class	Soil Description
	From	To						
10:20	0	4	2.0	0.0-0.5	0.5	Dry	Fill	Crush and run, asphalt
				0.5-2.0	0.5	Dry	M Sand	Light brown sand (select fill)
	4	8	3.0	4.0-5.0	0.5	Moist	M Sand	Light brown sand (select fill)
	8	12	1.2	8.0-9.0	30.0	Moist	M Sand	Dark gray sand, little gravel
				9.0-9.2	25.2	Moist	Silt	Light brownish-gray silt, some clay
	12	16	3.3	12.0-14.2	5.6	Moist	Silt	Light brownish-dark gray silt, some clay, strong petroleum odor
				14.2-15.3	433	Moist	Sand & Gravel	Light brown, light gray, red sand and coarse gravel, strong petroleum odor
	16	20	1.9	16.0-17.9	429	Wet	Sand & Gravel	Light brownish-gray and red sand and coarse gravel, strong petroleum odor

GPS Coordinates:	X= 602386.06	Y= 629251.86		
Sampling Data:	Boring not sampled.			

Modifiers:
and: 35% to 50 %
some: 20% to 35%
little: 10% to 20%
trace: <10%

BrightFields, Inc.
Environmental Services
801 Industrial St. Wilmington, DE (302) 656-9600

GEOPROBE® DRILLING LOG
BORING ID: GP-07

Project Name: Dodson Vapor Intrusion Investigation
Location: Dodson Ave.
Weather Conditions: Mid 40s, overcast
Drilling Method: Geoprobe®
Sample Interval (feet): Continuous
Driller: Rob McAllister

Project No.: 2734.02.21
Drilling Date(s): 2/26/13
Drilling Contractor: Northeast Regional Probing, Inc.
Type of Sample/Coring Device: Dual Core
Depth Groundwater Encountered (feet, bgs): 16.6
Logged By: Michael Oakley

Time	Plastic Sample Tube Depth From	Plastic Sample Tube Depth To	Core Recovery (feet)	Depth (feet)	PID Reading (ppm)	Moisture	Soil Class	Soil Description
13:28	0	4	2.5	0.0-0.6	-	Dry	Fill	Gravel, asphalt
				0.6-1.7	0.1	Dry	M Sand	Orange sand (select fill)
				1.7-2.5	21.6	Dry	Fill	Asphalt
	4	8	2.0	4.0-4.3	20.0	Moist	Fill	Asphalt
				4.3-4.9	15.3	Moist	Silt & Clay	Gray, brown silt and clay, trace gravel
				4.9-6.0	77.0	Moist	Silt	Brown silt loam
	8	12	4.0	8.0-11.3	23.5	Moist	Silt	Brown silt loam
				11.3-12.0	614	Moist	C Sand	Brownish-tan medium to coarse sand, little gravel
	12	16	2.4	12.0-14.4	806	Moist	Sand & Gravel	Brownish-white and tannish-gray coarse sand and gravel
	16	20	3.5	16.0-16.6	64.9	Very Moist	Silt & Clay	Gray clay loam (fine sand)
				16.6-19.5	602	Wet	Sand & Gravel	Grayish-brown medium to coarse sand and gravel

GPS Coordinates:	X= 602378.96	Y= 629207.01		
Sampling Data:	Boring not sampled.			

Modifiers:
and: 35% to 50 %
some: 20% to 35%
little: 10% to 20%
trace: <10%

BrightFields, Inc.
Environmental Services
801 Industrial St. Wilmington, DE (302) 656-9600

GEOPROBE® DRILLING LOG
BORING ID: MW-42

Project Name: Dodson Vapor Intrusion Investigation
Location: Dodson Ave.
Weather Conditions: 40s, overcast, moderate wind
Drilling Method: Geoprobe®
Sample Interval (feet): Continuous
Driller: Rob McAllister

Project No.: 2734.02.21
Drilling Date(s): 2/28/13
Drilling Contractor: Northeast Regional Probing, Inc.
Type of Sample/Coring Device: Dual Core
Depth Groundwater Encountered (feet, bgs): 16
Logged By: Michael Oakley

Time	Plastic Sample Tube Depth		Core Recovery (feet)	Depth (feet)	PID Reading (ppm)	Moisture	Soil Class	Soil Description
	From	To						
12:41	0	8	2.6	0.0-2.6	0.2	Moist	Silt & Clay	Brown silt and clay, trace gravel
	8	12	2.7	8.0-9.3	0.1	Moist		Brownish-gray silt and clay
				9.3-10.7	0.4	Moist	Sand & Gravel	Brownish-gray and whiteish-tan medium to coarse sand and gravel
	12	16	2.1	12.0-13.1	0.1	Moist		Brownish-gray and whiteish-tan medium to coarse sand and gravel, quartz
				13.1-14.1	0.1	Very Moist	M Sand	Gray and dark grayish-brown medium sand, some gravel
	16	20	1.6	16.0-17.6	11.6	Wet	Sand & Gravel	Grayish-brown and tan coarse sand and gravel, moderate petroleum odor

GPS Coordinates:	X= 602477.58	Y= 629352.26	Surface Elev: 79.81 ft	Groundwater Elev: 63.81 ft
Sampling Data:	Boring not sampled.			

Modifiers:
and: 35% to 50 %
some: 20% to 35%
little: 10% to 20%
trace: <10%

BrightFields, Inc.
Environmental Services
801 Industrial St. Wilmington, DE (302) 656-9600

GEOPROBE® DRILLING LOG
BORING ID: MW-38

Project Name: Dodson Ave. Vapor Intrusion Investigation
Location: Dodson Ave.
Weather Conditions: Sunny, 50s
Drilling Method: Geoprobe®
Sample Interval (feet): Continuous
Driller: Rob McAllister

Project No.: 2734.02.21
Drilling Date(s): 10/16/12
Drilling Contractor: Northeast Regional Probing, Inc.
Type of Sample/Coring Device: Dual Core
Depth Groundwater Encountered (feet, bgs): 16.7
Logged By: Nick Bradley

Time	Plastic Sample Tube Depth		Core Recovery (feet)	Depth (feet)	PID Reading (ppm)	Moisture	Soil Class	Soil Description
	From	To						
8:30	0	4	4.0	0.0-0.5	0.0	Moist	Silt	Dark brown silt, some organics, trace clay, trace sand
				0.5-4.0	0.2	Moist		Brown silt, trace clay, trace medium gravel
	4	8	4.0	4.0-6.7	0.0	Moist		Brown silt, trace clay, little gravel, little medium to coarse sand
				6.7-8.0	0.0	Moist		Light brown silt, some medium sand, trace coarse gravel
	8	12	2.6	8.0-9.3	0.0	Moist	Silt & Sand	Light brown silt and sand, little rounded gravel
				9.3-10.8	0.0	Moist		Light brown silt and sand, little clay
	12	16	4.0	12.0-13.2	0.0	Moist	Clay	Light reddish-brown clay with some silt and trace gravel
				13.2-15.6	0.0	Moist		Light reddish-brown clay little medium sand trace silt
				15.6-16.0	0.0	Moist		Light brown clay, little medium sand, trace silt
	16	20	3.3	16.0-16.7	0.0	Moist		Light brown clay, little medium sand, trace silt
				16.7-19.3	0.0	Wet	Sand & Gravel	Brown medium to coarse sand and gravel, trace silt

GPS Coordinates:	X= 602465.86	Y= 629004.32	Surface Elev: N/A	Groundwater Elev: 65.77 ft
Sampling Data:	N/A			
Sampled By:	N/A			

Modifiers:
and: 35% to 50 %
some: 20% to 35%
little: 10% to 20%
trace: <10%

APPENDIX B

SUB-SLAB VAPOR MITIGATION SYSTEM EMISSIONS ESTIMATES

Worst Case Scenario Emissions Estimates
Sub-Slab Vapor Mitigation System
Former Wilmington Assembly Plant
Wilmington, DE

Active System Projections

Chemical	Sub-slab Concentration (µg/m^3)	Sub-slab Mass (lbs/m^3)	Flow Rate (m^3/min)	Flow Rate** (ft^3/min)	Mass (lbs/min)	Mass (lbs/day)
1,2,4-Trimethylbenzene	4.90E+01	1.08E-07	4.70	166	5.08E-07	0.001
2,2,4-Trimethylpentane	4.60E+01	1.01E-07	4.70	166	4.77E-07	0.001
Benzene	3.70E+03	8.16E-06	4.70	166	3.83E-05	0.055
Cyclohexane	2.40E+02	5.29E-07	4.70	166	2.49E-06	0.004
Ethylbenzene	4.30E+01	9.48E-08	4.70	166	4.46E-07	0.001
m,p-Xylene	1.10E+02	2.43E-07	4.70	166	1.14E-06	0.002
n-Heptane	1.50E+02	3.31E-07	4.70	166	1.55E-06	0.002
n-Hexane	2.60E+03	5.73E-06	4.70	166	2.69E-05	0.039
Toluene	7.50E+01	1.65E-07	4.70	166	7.77E-07	0.001
Xylene, o-	4.30E+01	9.48E-08	4.70	166	4.46E-07	0.001
Xylene, total	4.30E+01	9.48E-08	4.70	166	4.46E-07	0.001
Total Mass					7.36E-05	0.106

** For a worst case active system scenario, the exhaust is calculated using an active RadonAway™ RP145 radon mitigation fan on top of all of the vent stacks. The model RP145 fan can exhaust approximately 166 cubic feet per minute (CFM) of air assuming a static pressure of 0.0 inches of water.

Permit required if total mass is greater than 10 pounds per day.
Registration required if total mass is between 0.2 and 10 pounds per day.

APPENDIX C

PRELIMINARY COST ESTIMATES

Table C-1
Cost Estimate for Sub-Slab Vapor Mitigation System
Former Wilmington Assembly Plan
Wilmington, DE

	Capital Costs - Sub-Slab System Installations	Unit		Rate		Total
Item 1	Design, Management, Administration	1	Lump Sum	$1,960.00	$	1,960
Item 2	Labor	1	Lump Sum	$5,628.00	$	5,628
Item 3	Equipment and Supplies	1	Lump Sum	$2,273.60	$	2,274
Item 4	Sub Contractor	1	Lump Sum	$12,650.00	$	12,650
Item 5	Miscellaneous	1	Lump Sum	$500.00	$	500
				Subtotal	$	23,012
			Contingency	15%	$	3,452
				Subtotal	**$**	**26,463**

	Operations, Maintenance, Monitoring (Annual)	Unit		Rate		Total
Item 1	Project Management, Administration	1	Lump Sum	$4,572.00	$	4,572
Item 2	Labor	1	Lump Sum	$14,876.00	$	14,876
Item 3	Equipment and Supplies	1	Lump Sum	$0.00	$	2,130
Item 4	Laboratory	1	Lump Sum	$16,585.40	$	16,585
				Subtotal	$	38,163
			Contingency	15%	$	5,724
				Subtotal	**$**	**43,888**

Table C-2
Cost Estimate for Soil Vapor Extraction System
Former Wilmington Assembly Plant
Wilmington, DE

	Capital Costs - SVE System Installation	Unit		Rate		Total
Item 1	Design, Management, Administration	1	Lump Sum	$13,804.00	$	13,804
Item 2	Labor (Installation, Start-up, etc.)	1	Lump Sum	$50,796.00	$	50,796
Item 3	Equipment and Supplies	1	Lump Sum	$98,321.35	$	98,321
Item 4	Soil sampling and disposal	300	Tons	$71.50	$	21,450
	Sampling	4	Each	$150.00	$	600
Item 5	Sub Contractor - Electrician	1	Lump Sum	$8,800.00	$	8,800
Item 6	Sub Contractor - Fence	1	Lump Sum	$3,850.00	$	3,850
Item 7	Sub Contractor - Well Installation	6	Wells	$2,000.00	$	12,000
Item 8	Miscellaneous	1	Lump Sum	$500.00	$	500
				Subtotal	$	210,121
			Contingency	15%	$	31,518
				Subtotal	**$**	**241,640**

	Operations, Maintenance, Monitoring (Annual)	Unit		Rate		Total
Item 1	Management, Administration	1	Lump Sum	$11,245.00	$	11,245
Item 2	Labor (Site visits, sampling, reporting)	1	Lump Sum	$30,594.00	$	30,594
Item 3	Equipment and Supplies	1	Lump Sum	$3,749.50	$	3,750
Item 4	Laboratory	1	Lump Sum	$17,160.00	$	17,160
Item 5	Electric	1	Lump Sum	$13,200.00	$	13,200
Item 6	Miscellaneous	1	Lump Sum	$200.00	$	200
				Subtotal	$	76,149
			Contingency	15%	$	11,422
				Subtotal	**$**	**87,571**