Analysis of Brownfields Clean-up Alternatives

Former Racing Oil Service Station
City of Chicopee, Massachusetts
April 13, 2017

Introduction and Background

Site Location: Former Racing Oil Service Station
181 Center Street
Chicopee, MA 01013
Owner: City of Chicopee

Previous Uses of the Site: The former Racing Oil Service Station property consists of approximately 0.28 acres of land, originally developed during the 1920s. Former business names include Pride Convenience and Republic Oil. Racing Oil is the most recent company to have operated the Site as a gasoline service station. Site improvements consisted of a single-story kiosk, pump dispensers and a paved parking area. According to Chicopee Fire Department records, three (3) 10,000-gallon gasoline underground storage tanks (USTs) were installed on the property in 1974. These USTs were upgraded with cathodic protection in December 1998 and ultimately removed in December 2004.

The City took ownership of the Site on December 14, 2011 through tax foreclosure, initiated on November 19, 2009. Racing Oil is part of the City's West End neighborhood and identified as a key redevelopment property in the *Chicopee West End Brownfields Area-Wide Plan* (AWP) completed in June 2012 with funding from an U.S. Environmental Protection Agency (U.S. EPA) Brownfields Area-Wide Planning Pilot grant awarded to the Pioneer Valley Planning Commission (PVPC), the City's project partner.

Past Assessment Findings: Several releases of petroleum products have been reported to the Massachusetts Department of Environmental Protection (MassDEP) since 1987. Gasoline-related compounds have been detected in soil and groundwater samples collected from the former UST area and from downgradient areas beyond the northwest border of the property. Contaminants of Concern (COCs) include gasoline-related constituents such as benzene, toluene, ethylbenzene, xylenes (BTEX), naphthalene, methyl tert-butyl ether (MtBE), volatile petroleum hydrocarbon (VPH) ranges as well as metals in soil and groundwater. Changes in regulatory cleanup standards enacted in 2014 by MassDEP increased acceptable levels of some compounds, including chromium and nickel, such that previously detected metal concentrations on the Site are no longer considered to pose a significant risk and therefore, do not require remediation.

Due to contaminant releases encountered at the Site during the 1980s and 1990s, several investigations were undertaken. The following provides a summary of Release Tracking Numbers (RTNs) that have been assigned by MassDEP to the Site since 1987:

- ***RTN 1-00044*** was assigned in 1987 after a release of gasoline from a leaking UST impacted soil and groundwater. A Class B-1 Response Action Outcome (RAO) was submitted to

MassDEP in February 1997 for this release, indicating that the release no longer poses a significant risk to human health or the environment.

- ***RTN 1-12664*** was assigned in October 1998 after an operator discovered a 422-gallon inventory discrepancy. Additionally, approximately six inches of light non-aqueous phase liquid (LNAPL) was discovered in a monitoring well downgradient from the pump islands and volatile organic compounds (VOCs) were detected above five milligrams per liter (mg/L) in a monitoring well located within 30 feet of a residence.

- ***RTN 1-12892*** was assigned in 1999 when a pressure drop detected in one of the product lines represented a threat of release. Subsequent UST and product line testing failed to identify the source of the pressure drop, as no leaks were detected.

- ***RTN 1-19116*** was assigned in June 2013 following completion of a Targeted Brownfield Assessment (TBA) at the Site, funded by Region 1 of the U.S. EPA. Reportable concentrations of chromium, nickel and chloroform were detected in soils at the Site. The City complied with all required MassDEP reporting requirements.

Prior to the TBA completed in May 2013 with support from Region 1 of the U.S. EPA, site characterization efforts included installation of approximately 28 soil borings and 27 monitoring wells within and downgradient to the Site. Soil sampling results detected the presence of BTEX, naphthalene, MtBE and VPH. VPH concentrations (C9-C10 aromatics) were detected in soils above Massachusetts Contingency Plan (MCP) Method 1 Standards for Category S-1/GW-2 and S-1/GW-3 soil.

Several rounds of groundwater sampling were completed as part of the initial characterization of the Site. Gasoline-related contaminants were detected in groundwater samples above MCP Method 1 Standards for Category GW-2 and GW-3 groundwater. The extent of the contaminant plume was delineated to extend west below Center Street to Park Street. Prior to the TBA, the most recent groundwater data had been collected during the summer of 2005.

Past Cleanup Activities: On December 9, 1998, 73.27 tons of gasoline-impacted soil were generated during the underground storage tank (UST) system upgrade and removed from the Site under a Bill of Lading (BOL). The excavation activities were approved by MassDEP under an Immediate Response Action (IRA) for RTN 1-12664.

A Phase III Remedial Action Plan (RAP) and Phase IV Remedial Implementation Plan (RIP) were submitted to MassDEP in 2003 recommending high vacuum extraction (HVE) and monitored natural attenuation (MNA) as the Site remedy to address petroleum contamination in groundwater.

In November 2004, the Chicopee Fire Department reportedly ordered the Site owner to remove the three (3) USTs present on-site and in December 2004, those tanks were removed.

In 2006, a Revised Phase III/Phase IV was submitted to MassDEP by Racing Oil, LLC's consultant. The revised remedy included biosparging, monitored natural attenuation (MNA) and an Activity and Use Limitation (AUL). It appears that this remedy was never implemented at the Site, since the MassDEP files do not contain any further documentation of response actions. However, a series of financial inability

applications are located in the MassDEP file for the Site.

In November 2006, an Administrative Consent Order was signed by MassDEP and the Site Owner (Racing Oil, LLC) requiring the completion of additional response actions or the submittal of Financial Inability (FI) status. The FI paperwork was submitted and approved by MassDEP in April 2007. The most recent renewal of Racing Oil's FI status expired in October 2013.

Project Goals: The former Racing Oil Service Station is a Brownfields property, identified and studied for redevelopment as part of the City's West End Brownfields Area-Wide Planning (AWP).The City of Chicopee in collaboration with PVPC was successful in securing funding through the EPA pilot Area-Wide Planning Program and completed work with professional consultants in June 2012.

The West End Brownfields AWP seeks to reinvigorate and spark reinvestment in the West End by re-branding the area as an attractive, green neighborhood where people can live, work, learn and play. An overall market assessment identifies potential demand for industrial/commercial space and rental housing units, while identifying niche market commercial uses as well as appropriate target markets for mill building residences. Through realistic strategies and market-driven initiatives, this plan aims to return key West End Brownfields to productive use over the next three (3) to five (5) years. The plan also addresses limitations in the neighborhood's infrastructure and recommends public improvements that will facilitate private property redevelopment in the West End.

The West End Vision, as defined by the AWP, calls for the creation of a distinctive, attractive, hip, affordable and safe downtown neighborhood and is based on market findings, public input, existing conditions and successful case studies of Brownfields redevelopment across the Commonwealth. Noted as part of the plan, the revitalization of older urban centers should encompass a scale and development type that is distinctive from residential and commercial spaces available in suburban and rural locations within the area's larger geographic region. Older urban centers appeal to businesses and residents who desire an environment that offers distinctive buildings and spaces, walkable streets, density and amenities that cannot be replicated in other city neighborhoods or suburban areas, all qualities the West End exhibits.

Based on this Vision, the project team developed concepts for the West End that focused on five primary areas: Mill properties, Delta Park/former Hampden Steam Plant, the Riverfront, Residential and the Gateway. Focusing efforts on these key areas will have significant synergistic effects on the redevelopment potential of other properties in the West End.

The Racing Oil Property is most closely associated with the Gateway Area - located just a few parcels away from the boundary of the Gateway. The property is defined in the AWP plan as an 'infill' site with potential reuse for small office, retail space or an electric car charging station/related transportation use or greenspace in support of the Gateway's reuse strategies, as the neighborhood's market demands shift with redevelopment of the larger priority areas. While these priority areas are tackled, the AWP suggests short term improvements to these infill sites including assessment, completion of any required cleanup activities and improving the aesthetics and marketability of these sites to showcase the City's commitment to redevelopment. This land banking strategy will provide a visible City commitment to the property until the market provides an appropriate redevelopment demand to move forward with the recommended reuse strategy.

Summary of Targeted Brownfields Assessment, May 2013: Nobis Engineering, Inc. completed Targeted Brownfields Assessment efforts at the Racing Oil property for the U.S. EPA under Contract No. EP-S1-06-03, Task Order No. 0082-SI-BZ-0010. The TBA's objective was to fill data gaps associated with historic environmental assessment activities conducted at the Site and to assess the current extent of soil and groundwater contamination. Soil and groundwater sampling data collected during the TBA were compared to Massachusetts Contingency Plan (MCP) criteria to evaluate the nature and extent of contamination and to estimate potential risks associated with contaminated environmental media. TBA investigation activities and reporting were conducted in accordance with a U.S. EPA approved Field Task Work Plan/Quality Assurance Project Plan (FTWP/QAPPA) prepared by Nobis on November 29, 2012 and approved by U.S. EPA on December 14, 2012.

Nobis conducted TBA field activities in January and April 2013. Soil boring advancement, soil sampling and monitoring well installation were completed on January 22 & 23, 2013. A monitoring well inventory, well development, groundwater level measurements, groundwater sample collection and monitoring well elevation survey were conducted between April 8 & 11, 2013.

Historical releases of petroleum hydrocarbons occurring because of former Site operations have resulted in soil and groundwater contamination at levels that could pose a risk to human health and the environment. The primary source of contamination is believed to be within the former UST area, where historical releases of gasoline reportedly occurred. Soil sampling data and field screening information collected during the TBA identified a zone of contaminated soil within the former UST area that appears to be residual contamination from historical releases from the tanks. This zone of contaminated soil extends vertically from the bottom of the backfill material placed after tank removal to the top of a silt layer that is encountered at approximately eight (8) feet below ground surface (bgs) in the east (upgradient) portion of the Site to approximately 16 feet bgs in the west (downgradient) portion of the Site. The horizontal extent of soil contamination appears to extend from the easternmost UST and the former concrete pad toward the west and northwest property boundaries (paved parking area and Center Street, respectively). The total estimated volume of contaminated soil present in this area is 800 cubic yards (1,200 tons).

Petroleum constituents released to the environment in the UST area migrated downward to the water table and dissolved into Site groundwater. Dissolved contaminants subsequently migrated horizontally with the flow of groundwater to create a contaminant plume extending to the northwest across Center Street. The horizontal extent of C5-C8 aliphatics contamination in groundwater exceeding MCP Method 1 GW-2 risk assessment standards extends from the former UST area to the northwest approximately 250 feet past the northwest wall of the commercial building at 178 Center Street and is approximately 125 feet wide. A portion of the volatile petroleum hydrocarbon (VPH) plume extends beneath the commercial building located at 178 Center Street.

The following is a summary of the comparison of analytical data collected during the TBA (by Nobis in 2013) to MCP Method 1 risk assessment standards:

- Fuel-related compounds detected above Method 1 S-1/GW-2/GW-3 standards in soil samples included C5-C8 aliphatics, C9-C10 aromatics, C9-C18 aliphatics and chloroform. These exceedances of MCP Method 1 risk assessment standards for fuel related compounds in soil were limited to soil samples collected from soil borings advanced within the former UST area.

- The heavy metals chromium and nickel were detected above Method 1 S-1/GW-3 risk assessment standards in soil samples collected from the former UST area and from borings advanced by Nobis in 2013 in the downgradient plume area. These metals were also detected above Reportable Concentrations for Category RCS-1 Soil, which represented a new 120-day release condition that was reported to MassDEP (RTN 1-19116) by the City on June 12, 2013. These metals are not believed to be associated with the release of gasoline that occurred at the Site. Moreover, changes in regulatory cleanup standards enacted in 2014 by MassDEP increased acceptable levels of some compounds, including chromium and nickel, such that previously detected metals concentrations on the Site are no longer considered to pose a significant risk and, therefore, do not require remediation
- Groundwater contaminants detected above Method 1 GW-2/GW-3 standards include C5-C8 aliphatics, C9-C12 aliphatics and total xylenes. Method 1 standards were exceeded in groundwater samples collected from MW-SA-1, CEA-4 and MW-A.

Based on the environmental data collected by Nobis in 2013 during the TBA and by Tighe & Bond in 2016, a comparison to current MCP Method 1 risk assessment standards, and considering a preliminary method 3 Risk Characterization conducted by Tighe & Bond, soil remediation is necessary to reduce contaminant levels so that a Condition of No Significant Risk can be achieved.

Summary of Additional Assessment, 2016: Tighe & Bond was retained by the City to provide additional environmental consulting services for the project, including the collection of additional assessment data to update and expand understanding of current site environmental conditions and to prepare an updated ABCA and construction bidding documents to refine and implement the selected remediation approach for the property. Tighe & Bond completed the additional data collection in October and November 2016, which included the following actions:

- Installation of two new soil borings/monitoring wells, TB-1-16, TB-2-16, in the southwest corner of the property;
- Installation of two (2) borings and collection of soil samples within the former tank grave, DISP-1, DISP- 2;
- Replacement of damaged groundwater monitoring well CEA-1 with CEA-1R;
- Collection and analyses of groundwater samples from nine (9) monitoring wells;
- Conduction of a ground penetrating radar (GPR) survey of the property; and
- Installation of two (2) soil gas points through the slab of the building located at 178 Center Street and collection/analysis of soil gas samples from those points.

Tighe & Bond investigation activities were conducted in accordance with a U.S. EPA approved Site-Specific Quality Assurance Project Plan (SSQAPP) approved by U.S. EPA on September 14, 2016. The details of Tighe & Bond's findings are provided below.

<u>Soil Sample Results</u>
Two (2) soil samples were collected for analysis at each of the borings TB-1-16 and TB-2-16. Samples were selected for base laboratory analysis based on field screening and visual observations

and were analyzed at ConTest Environmental Laboratory of East Longmeadow, Massachusetts (ConTest) for extractable and volatile petroleum hydrocarbons (EPH/VPH). All sampling locations are indicated on the plan included in Appendix A. Analytical results are summarized on Table 1 included in Appendix B. As indicated on the table, no exceedances of Method 1 cleanup standards were detected in these samples, confirming the southern extent of contamination previously identified by Nobis Engineering.

The two disposal samples (DISP), were composited into one (1) sample. Sample results are summarized in Table 2, which indicate slightly elevated concentrations of gasoline components, but not at levels that exceed Method 1 standards.

Groundwater Sample Results

Groundwater samples were collected from nine (9) monitoring wells located on the 181 Center Street property and across the street at the 178 Center Street property. Groundwater analyses were conducted by ConTest. Results are summarized on Table 4 in Appendix B. Those data indicate exceedances of GW-2 groundwater standards on the 181 Center Street property near the street line, in MW-CEA-1R and MW-SA-1; however; contaminant concentrations in groundwater in wells located on the 178 Center Street property do not exceed the applicable GW-2 cleanup standards, thus indicating that a groundwater to indoor air pathway at 178 Center Street is unlikely.

Soil Gas Sampling Results

Tighe & Bond installed two (2) soil vapor sample points through the slab of the 178 Center Street building to facilitate the collection of soil gas samples on August 31, 2016. Samples were analyzed for air petroleum hydrocarbons (APH). APH results are summarized on Table 3 (Appendix B) and compared to residential and commercial screening values developed by MassDEP.
As indicated on the table, low levels of some gasoline constituents were detected in the two (2) soil vapor samples, but at levels significantly lower than what MassDEP considers a potential risk to indoor air.

Ground Penetrating Radar Survey

Tighe & Bond conducted a ground penetrating radar (GPR) survey of the property to determine if additional underground storage tanks (USTs) were present on the property. Tighe & Bond had visually identified a fill pipe and cap protruding from the ground toward the southeast corner of the property, which was suspected of being associated with a previously unidentified waste oil UST. The GPR survey confirmed the presence of a subsurface anomaly, indicative of a UST with an estimated size of approximately 1,000 gallons. The approximate location of the UST is depicted on the Site Plan in Appendix A.

Site Remediation Approach

Previous assessment and remediation evaluation options were detailed by Nobis Engineering in the TBA report from May 2013 (described above), which identified three (3) feasible options for remediating site contaminants:

- Monitored Natural Attenuation (MNA);
- Soil excavation with offsite disposal and MNA; and
- Soil excavation with offsite disposal and in situ groundwater treatment.

The recent 2016 data collection efforts indicate that groundwater contamination levels on the west side of Center Street do not exceed applicable MCP GW-2 cleanup standards. Sub-slab soil vapor analytical data confirmed vapor intrusion into the 178 Center Street building is not occurring at levels that would constitute a risk, as defined by MassDEP in the MCP. ***Consequently, in situ groundwater remediation at the Site is no longer necessary to achieve a condition of No Significant Risk.***

Nobis concluded that soil excavation with offsite disposal is an effective method by which to achieve a Permanent Solution, as defined in the MCP. Removal of portions of residual source soils will overtime lead to an improvement in groundwater quality to levels achieving No Significant Risk. Monitoring of on-site groundwater wells, in particular wells SA-1 and CEA-1R, could be performed to document this improvement. ***Alternatively, a Permanent Solution with Conditions – as defined and made available in the 2014 MCP regulatory revisions – could be applied to the Site to address potential exposure pathways (groundwater to indoor air) associated with residual groundwater contamination in the areas of these two (2) wells should a building be constructed on the property***.

Nobis developed a Proposed Remediation Area plan that they identified an excavation area measuring approximately 55 feet by 60 feet. The data indicate that the top eight (8) feet of fill material in that area is clean and can be segregated and reused as backfill. Nobis developed cost estimates for the excavation and offsite disposal of 1,200 tons of contaminated soil and follow-up groundwater monitoring. The 2016 analytical data indicates that a smaller, focused excavation of the most contaminated source soils identified by Nobis (B5) may leave S-1 soil exceedances in place adjacent to the sidewalk, Nobis samples B1, B2, B3 (see Appendix C for a copy of Nobis Table 4 2013 soil data).

Tighe & Bond has conducted a preliminary Method 3 Risk Characterization of residual soil concentrations assuming the Nobis B-5 soils were removed. Tighe & Bond developed exposure point concentrations (EPC) using the remaining 2013 Nobis soil data and conducted a Method 3 Short Form risk evaluation for four (4) exposure receptor scenarios: residential, construction worker, park visitor and trespasser. In each case, the resultant Hazard Index (HI) is less than the significant risk threshold of 1.0. Based on the results of this preliminary Method 3 evaluation, it appears that ***a Condition of No Significant Risk for soils can be achieved for all exposure scenarios using this focused excavation approach.*** Copies of the Method 3 Short Form summary tables are included in Appendix D.

Applicable Regulations and Cleanup

Cleanup Oversight Responsibility: The Commonwealth requires property owners to hire a Licensed Site Professional (LSP) if cleanup activities are deemed necessary. As defined by the Commonwealth, the LSP "ensures that actions taken to address contaminated property comply with Massachusetts regulations and protect public health, safety, welfare and the environment." In Massachusetts, LSPs are licensed by the Commonwealth Board of Registration of Hazardous Waste Site Cleanup Professionals.

Following a public procurement process, the City has contracted with Tighe & Bond for Licensed Site Professional (LSP) Services for the Racing Oil related to oversight, assessment and cleanup of petroleum contamination. The environmental regulation governing cleanup of the Site is the Massachusetts Contingency Plan (MCP). Cleanup Contractors needed to perform the proposed

cleanup project will be retained following all federal (40 CFR 31.36) and state public procurement guidelines. Tighe & Bond will be assisting the City in the preparation of public procurement documents for cleanup contractor services related to the soil remediation at the Racing Mart site.

***Laws & Regulations Applicable to the Cleanup**:* The MCP, 310 COR 40.0000, is the state regulation that governs the cleanup of petroleum constituents that are released to the environment. In addition to these regulations, MassDEP has developed numerous guidance documents and policies that govern the manner in which the presence of contaminated environmental media are determined and the manner in which they are removed, handled and disposed. Such regulations are very prescriptive and close adherence to the requirements is required, except in unusual circumstances when site-specific requirements are waived by state regulators. In this case, the LSP has jurisdiction over most activities involving the assessment and remediation of contaminated soil and groundwater, with MassDEP providing an oversight role.

There are numerous policy and guidance documents that also regulate the assessment and remediation of contaminated environmental media. The following is a summary of guidance documents published by MassDEP with a specific focus on the assessment and remediation of sites contaminated with petroleum constituents as well as disposal sites located in urban areas:

- MassDEP WSC-02-411 Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of the MADEP VH/EPH Approach;
- MassDEP WSC-94-400 Interim Remediation Waste Management Policy for Petroleum Contaminated Soils;
- MassDEP Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology (2004);
- MassDEP Technical Update: Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil

Evaluation of Clean-up Alternatives

As part of the TBA process, Nobis Engineering evaluated potential cleanup alternatives based on contaminant sources and groundwater plume extents delineated during the TBA and in previous investigations. Nobis focused this evaluation on potential cleanup alternatives that:

1. are likely to achieve a level of No Significant Risk (NSR) at the Site and enable the achievement of an MCP Permanent Solution;
2. address MCP requirements regarding source elimination/control and restoration to background; and
3. appeared to be technically and economically feasible.

Tighe & Bond evaluated the 2013 Nobis data in conjunction with the 2016 data to amend the site remediation approach to reflect current site conditions indicating reduced offsite impacts to groundwater, a lack of offsite soil vapor to indoor air exposure pathways, changes to MCP regulatory

standards implemented in 2014 subsequent to the Nobis investigation and the results of a preliminary Method 3 risk characterization, which show that a condition of no significant risk can be achieved by focusing on removal of the most highly contaminated source soils while leaving some contaminated soils in place.

Clean-up Alternative A – Monitored Natural Attenuation

This option would consist solely of continued groundwater monitoring to evaluate concentration trends throughout the plume until contaminant levels were reduced to cleanup goals through natural processes. This option would include no active remediation of soil or groundwater.

Effectiveness: Based on a review of historical groundwater sampling data from the contaminant plume, this option would not likely be effective and would not achieve a Permanent Solution within a reasonable timeframe. Contaminant concentrations in monitoring wells throughout the plume area have remained high since the mid-1990s, with no discernible downward trend, which suggested that subsurface conditions in the plume area were not amenable to natural degradation of petroleum constituents or that petroleum constituents are leaching from contaminated soils into the groundwater at a rate that is equal to or greater than the rate of natural degradation. This alternative would also not address potential risks associated with soil contamination.

Tighe & Bond's 2016 data indicate that groundwater contamination still exists on the Racing Oil property in wells CEA-1 and MW-SA-1 near the sidewalk/street line and likely beneath the footprint of the paved Center Street roadway, at levels that exceed GW-2 cleanup standards. Groundwater results from samples collected from wells on the west side showed significantly lower contamination levels, all of which were below the applicable MCP GW-2 and GW-3 groundwater cleanup standards. This option could ultimately achieve GW-2 cleanup levels in the CEA-1, SA-1 areas but will extend the timeframe by which those cleanup levels are achieved.

Implementability: This option would be implementable using readily available resources and traditional environmental sampling and analytical methods.

Impacts from Regional Climate Change Projections: The Northeast region is projected to see increased temperatures in addition to increase in the magnitude and frequency of heavy precipitation events should changes to regional climate characteristics continue. An increase in heavy precipitation events increases the potential of flooding. The impact to Monitored Natural Attenuation would be minimal in nature, as the groundwater vadose zone naturally increases and decreases based on weather patterns and precipitation events. Groundwater would continue to respond as such even under increased magnitude and frequency. The potential for flooding is also minimal as the Site is not located within or near any identified flood zones within the City.

Clean-up Alternative B – Focused Soil Excavation & Offsite Disposal with Monitored Natural Attenuation

This option would include the excavation and off-site disposal of contaminated soil from the former UST area, focused around the area of Nobis sample B5 and monitored natural attenuation for the groundwater plume. Alternative B would include the following activities:

- Excavation and off-site disposal of six-hundred (600) tons of contaminated soil;
- Dewatering of the excavation area and on-site treatment of contaminated groundwater;

- Collection of post-excavation soil samples for laboratory analysis;
- Backfilling of the excavation area with clean soil;
- Preparation of a Final method 3 risk characterization using post excavation soil results; and
- Long-term monitoring of groundwater.

Effectiveness: Excavation and off-site disposal of contaminated soil would be an effective and permanent measure to eliminate potential future exposure to contamination and reduce source soils contributing to Site groundwater contamination. Post-excavation confirmatory soil sampling would be performed to verify achievement of cleanup goals and to support future evaluations of risk. The removal of the most highly contaminated soil in the former UST area would also minimize further leaching of contaminants into the groundwater, accelerating the progress of groundwater cleanup in the MW CEA-1 and MW SA-1 areas.

The effectiveness of soil excavation may be limited by the Site's physical boundaries. Elevated levels of petroleum contamination are present along the northern Site boundary; therefore, soil contamination may extend beneath Center Street. Nobis and Tighe & Bond have assumed that excavation of soils beneath Center Street and adjacent to the sidewalk is not feasible; therefore, it is possible that some contaminated soil would remain after completion of excavation activities. Tighe & Bond's preliminary Method 3 risk characterization indicates that a condition of No Significant Risk can be achieved while leaving these soils in place.

After removal of the primary source of contamination to the groundwater (i.e. the most highly contaminated soils in the former B5 UST area), monitored natural attenuation may be an effective strategy for achievement of a Permanent Solution for groundwater. Petroleum hydrocarbons tend to be amenable to degradation through natural physical, chemical and biological processes. Without a continuing source of contamination leaching into the groundwater, concentration levels may permanently decrease to acceptable levels without any active treatment. Additionally, changes to the MCP regulations promulgated in 2014 now allow for the filing of a Permanent Solution with Conditions to address the potential for a groundwater to indoor air vapor intrusion pathway should construction of a building be planned for areas of the Racing Oil property with residual groundwater contamination exceeding GW-2 standards. In such cases, new building construction may require installation of a vapor mitigation system.

Implementability: This option would involve the removal and disposal of the accessible, most significantly contaminated source soils within the former UST area, centered on Nobis sample B5. While the geography and hydrogeology of the Site would create some technical challenges, this option would be implementable using traditional excavation methods and engineering controls. Removal of soils would be made more complex (and costly) because the limits of contaminated soil extend vertically to below the water table. This would necessitate dewatering of the excavation area to enable excavation of dry soils. Groundwater that is pumped from the excavation would then need to be treated prior to ultimate disposal, either on or offsite.

Monitored natural attenuation would consist of periodic monitoring of groundwater to evaluate temporal variations in contaminant concentrations and geochemical conditions in the aquifer. Typically, monitoring would commence on a quarterly schedule for two (2) or three (3) years, or until such time that the average contaminant concentrations in each of the wells, calculated over four (4) consecutive rounds of sampling, is less than GW-2 standards, at which time a PSS with Conditions could be

upgraded to a PSS without conditions.

Additional monitoring wells could be added to the existing well network, after soil removal, to gain an updated understanding of concentration trends throughout the plume area. All of these measures would be readily implementable using traditional environmental sampling and analytical methods.

Impacts from Regional Climate Change Projections: The Northeast region is projected to see increased temperatures in addition to increase in the magnitude and frequency of heavy precipitation events should changes to regional climate characteristics continue. An increase in heavy precipitation events increases the potential of flooding. The impact to Soil Excavation & Off-Site Disposal with Monitored Natural Attenuation would be minimal in nature, as the groundwater vadose zone naturally increases and decreased based on weather patterns and precipitation events. Groundwater would continue to respond as such even under increased magnitude and frequency. The potential for flooding is also minimal as the Site is not located within or near any identified flood zones within the City.

Clean-up Alternative C – Soil Excavation & Off-Site Disposal with *In Situ* Groundwater Remediation Nobis evaluated this option in the 2013 TBA report. As described therein, this option would include the excavation and offsite disposal of contaminated soil from the former UST area and include active in-situ treatment of the groundwater instead of monitored natural attenuation. In situ treatment typically involves advancement of soil borings within the contaminant plume area for the purpose of injecting treatment reagents;

- Injection of treatment reagents into the subsurface to promote *in situ* chemical oxidation (ISCO) or *in situ* bioremediation (ISB); and
- Post-injection monitoring of groundwater to evaluate progress toward cleanup.

Tighe & Bond's 2016 assessment data indicate that groundwater contaminant concentrations on the west side of Center Street are now at levels below applicable MCP GW-2 standards. Additionally, sub-slab soil gas sampling conducted by Tighe & Bond at the 178 Center Street building indicates that a vapor intrusion pathway does not exist. Furthermore, 2014 revisions to the MCP allow the filing of a Permanent Solution with Conditions, to achieve regulatory closure, as a means of addressing residual groundwater contamination on the Racing Oil property. Consequently, in-situ treatment of groundwater is no longer considered necessary and has, thus, been removed from further consideration as a cleanup alternative.

Effectiveness: As discussed above, consequently, in-situ treatment of groundwater is no longer considered necessary and has, thus, been removed from further consideration as a cleanup alternative.

Implementability: As discussed above, consequently, in-situ treatment of groundwater is no longer considered necessary and has, thus, been removed from further consideration as a cleanup alternative.

Impacts from Regional Climate Change Projections: The Northeast region is projected to see increased temperatures in addition to increase in the magnitude and frequency of heavy precipitation events should changes to regional climate characteristics continue. An increase in heavy precipitation

events increases the potential of flooding. The impact to Soil Excavation & Off-Site Disposal with in situ groundwater remediation would be minimal in nature, as the groundwater vadose zone naturally increases and decreased based on weather patterns and precipitation events. Groundwater would continue to respond as such even under increased magnitude and frequency. The potential for flooding is also minimal as the Site is not located within or near any identified flood zones within the City.

Cost Estimates for Each Alternative

Clean-up Alternative A – Monitored Natural Attenuation
There would be ***no initial capital costs to implement this option***. Annual groundwater monitoring costs would be approximately $47,000 for quarterly sampling. Sampling would continue until such time that average contaminant concentrations, in each well, over four (4) consecutive quarterly sampling rounds are less that the GW-2 MCP cleanup standards.

Clean-up Alternative B – Focused Soil Excavation & Off-Site Disposal
The estimated capital costs for this alternative would be approximately ***$180,000***. Capital costs would include equipment, labor and material costs required to excavate, segregate, transport and dispose of contaminated soil within the former UST area centered on sample B5; collect soil samples to characterize post-excavation soil concentrations; dewater the excavation during soil removal operations; and backfill the excavation with clean fill. Annual monitoring costs for this option could be approximately
$47,000 for quarterly sampling if all existing groundwater monitoring wells are sampled. Under this cleanup option, groundwater monitoring would continue until average contaminant concentrations are reduced to acceptable levels (less than the MCP GW-2 cleanup standards, due to natural processes and the removal of the most highly contaminated residual source soils in the vicinity of B5. Depending upon the anticipated end use of the remediated Racing Oil property, a Permanent Solution with Conditions could be filed for the property to achieve MCP regulatory closure and forego the expenditures associated with groundwater monitoring. Conducting the groundwater monitoring post soil removal would document achievement of
GW-2 cleanup levels and eliminate a potential impediment to marketing the property.

Clean-up Alternative C – Soil Excavation & Off-Site Disposal with *In Situ* Groundwater Remediation
As discussed above, consequently, in-situ treatment of groundwater is no longer considered necessary and has, thus, been removed from further consideration as a cleanup alternative.

Recommended Clean-up Alternative:
Tighe & Bond evaluated two (2) cleanup alternatives for achieving Site closure at the Racing Oil property: monitored natural attenuation (MNA) and soil excavation with offsite disposal. Both options are available to address the health and safety concerns at the Site. Focused excavation scored higher than MNA in the comparative analysis included in Table E-1, provided in Appendix E and, thus, is the preferred option. The MNA remedial option would not likely be effective in reducing contaminant concentrations to levels that are needed to achieve a Permanent Solution within a reasonable timeframe. However, excavating soils from the area of greatest impact (B5 vicinity), based on the 2013

and 2016 data and a recent Method 3 risk characterization utilizing those data sets will likely achieve a condition of No Significant Risk, thereby achieving a Permanent Solution. A summary of applicable regulations for the project is included in Table E-2 - Applicable, Relevant, and Appropriate Requirements (ARARs), included in Appendix E.

To summarize the recommended alternative: based on a review of the 2013 Nobis data and the 2016 data collected by Tighe & Bond, it is recommended that the following revised Brownfields Cleanup approach be implemented at the Racing Mart site:

- Removal and offsite disposal of the 1,000 gallon UST;
- Removal and disposal, if applicable, of contaminated soils associated with the 1,000 gallon UST;
- Segregation of clean soils (0' to 8') followed by a contaminated soil excavation area focused around 2013 Nobis sample B5, totaling approximately 600 tons of excavation and off-site disposal;
- Backfilling and compacting with segregated clean onsite soils and clean offsite soils as needed;
- Preparation of a Permanent Solution Statement with Conditions (unless quarterly monitoring of groundwater demonstrates that contaminants are less than GW-2 standards, in which case a PSS without conditions would apply); and
- Follow-up groundwater monitoring of monitoring wells if a permanent Solution ***without*** Conditions is desired.

Appendix A

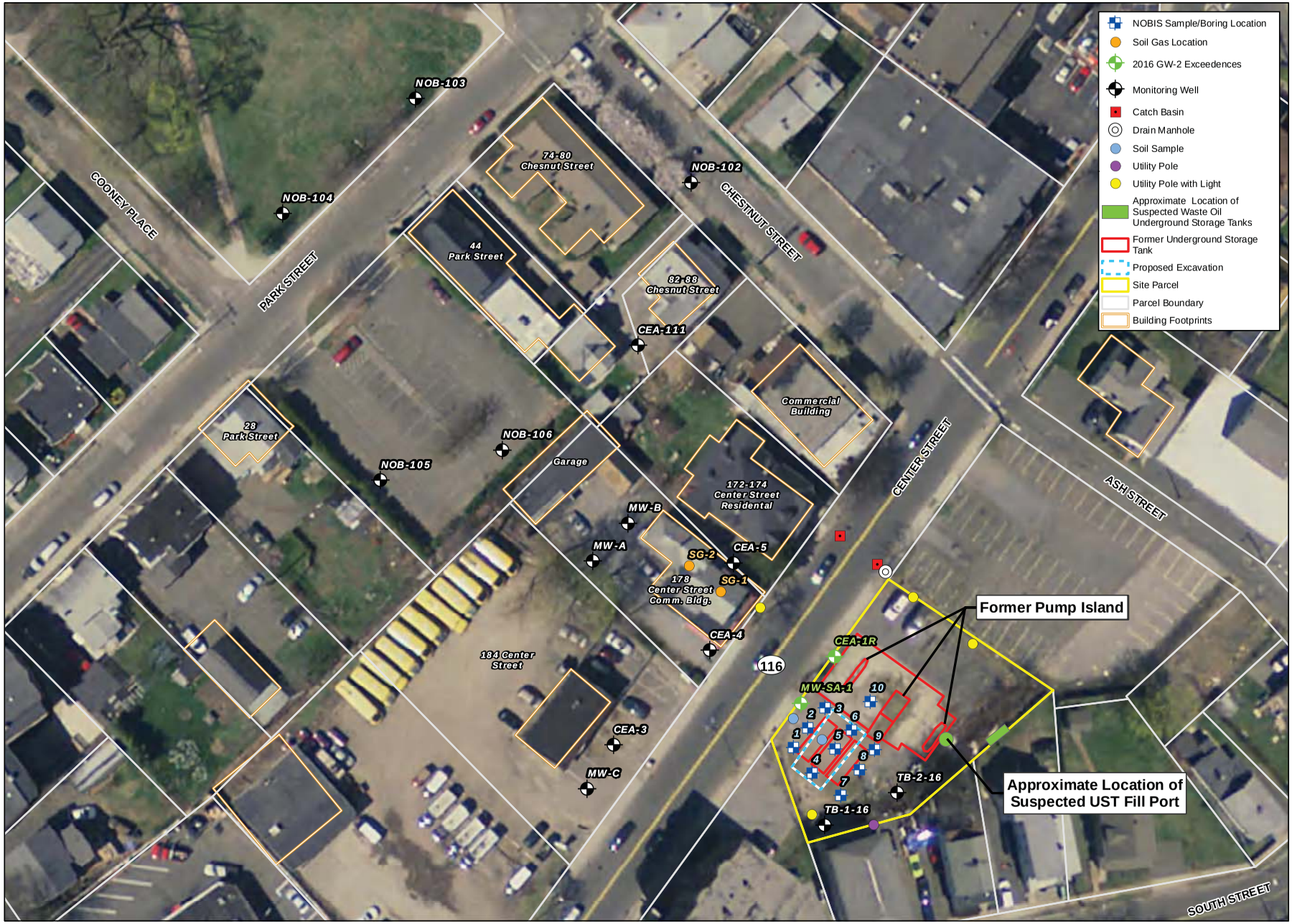

FIGURE 1
SITE PLAN

LOCUS MAP

N

0 25 50
Feet
1:600

NOTES

1. Based on MassGIS Color Orthophotography (2013).
2. Parcels (2015) downloaded from MassGIS and are approximate.

181 Center Street
Chicopee, Massachusetts

January 2017

Tighe&Bond
Engineers | Environmental Specialists

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C-1115

Appendix B

TABLE 1
Soil Analytical Results
Former Racing Oil Property
181 Center Street, Chicopee, MA
RTN 1-12664

Sample ID	Reportable Concentrations		MCP Method 1 Standards				TB-1-16 (10-12)	DUP-1	TB-2-16 (0-2')	TB-2-16 (5-7')
Depth (feet)							10-12	10-12	0-2	5-7
Date							10/12/2016	10/12/2016	10/12/2016	10/12/2016
PID Result (ppmv)	RCS-1	RCS-2	S-1/GW-2	S-1/GW-3	S-2/GW-2	S-2/GW-3				
EPH (mg/kg)										
C_{11}-C_{22} Aromatics	1,000	3,000	1,000	1,000	3,000	3,000	<13	<13	NA	<14
C_9-C_{18} Aliphatics	1,000	3,000	1,000	1,000	3,000	3,000	<13	<13	NA	<14
C_{19}-C_{36} Aliphatics	3,000	5,000	3,000	3,000	5,000	5,000	<13	<13	NA	<14
Acenaphthene	4	3,000	1,000	1,000	3,000	3,000	<0.13	<0.13	NA	<0.14
Acenaphthylene	1	10	600	10	600	10	<0.13	<0.13	NA	<0.14
Anthracene	1,000	3,000	1,000	1,000	3,000	3,000	<0.13	<0.13	NA	<0.14
Benzo[a]anthracene	7	40	7	7	40	40	<0.13	<0.13	NA	<0.14
Benzo[a]pyrene	2	7	2	2	7	7	<0.13	<0.13	NA	<0.14
Benzo[b]fluoranthene	7	40	7	7	40	40	<0.13	<0.13	NA	<0.14
Benzo[g,h,I,]perylene	1,000	3,000	1,000	1,000	3,000	3,000	<0.13	<0.13	NA	<0.14
Benzo[k]fluoranthene	70	400	70	70	400	400	<0.13	<0.13	NA	<0.14
Chrysene	70	400	70	70	400	400	<0.13	<0.13	NA	<0.14
Dibenz(a,h)anthracene	1	4	0.7	0.7	4	4	<0.13	<0.13	NA	<0.14
Fluoranthene	1,000	3,000	1,000	1,000	3,000	3,000	<0.13	<0.13	NA	<0.14
Fluorene	1,000	3,000	1,000	1,000	3,000	3,000	<0.13	<0.13	NA	<0.14
Indeno[1,2,3-cd]pyrene	7	40	7	7	40	40	<0.13	<0.13	NA	<0.14
2-Methylnaphthalene	1	80	80	300	80	500	<0.13	<0.13	NA	<0.14
Naphthalene	4	40	20	500	20	1000	<0.13	<0.13	NA	<0.14
Phenanthrene	10	1,000	500	500	1000	1000	<0.13	<0.13	NA	<0.14
Pyrene	1,000	3,000	1,000	1,000	3,000	3,000	<0.13	<0.13	NA	<0.14
VPH (mg/Kg)										
Benzene	2	200	2	40	200	200	<0.083	<0.083	<0.061	NA
Ethylbenzene	40	1,000	500	500	1,000	1,000	<0.083	<0.083	<0.061	NA
Methyl tert-butyl ether							<0.083	<0.083	<0.061	NA
m & p - Xylene	100	100	100	1,000	100	1,000	<0.17	<0.17	<0.12	NA
Naphthalene	4	40	20	500	20	1,000	<0.42	<0.42	<0.31	NA
o-Xylene	100	100	100	1,000	100	1,000	<0.083	<0.083	<0.061	NA
Toluene	30	1,000	500	500	1,000	1,000	<0.083	<0.083	<0.061	NA
C5-C8 Aliphatics	100	500	100	100	500	500	<17	<17	<12	NA
C9-C10 Aromatics	100	500	100	100	500	500	<17	<17	<12	NA
C9-C12 Aliphatics	1,000	3,000	1000	1000	3000	3000	<17	<17	<12	NA

NA - Not analyzed
Boxed values indicate exceedance of Applicable Method 1 or RCS-1/2 Standard
DUP-1: Duplicate of TB-1-16 (10-12)

TABLE 2

Soil Disposal Analytical Results

181 Center Street, Chicopee

Sample ID	Reportable Concentrations		MCP Method 1 Standards				Disp-1
Depth (feet)			S-1		S-2		10-16
Date	RCS-1	RCS-2	GW-2	GW-3	GW-2	GW-3	10/12/2016
VOCs (mg/kg)[1]							
n-Butylbenzene	NA	NA	NS	NS	NS	NS	7.1
sec-Butylbenzene	NA	NA	NS	NS	NS	NS	2.2
Isopropylbenzene	1,000	10,000	NS	NS	NS	NS	0.9
p-Isopropyltoluene	NA	NA	NS	NS	NS	NS	1.4
n-propylbenzene	100	1,000	NS	NS	NS	NS	6.5
1,2,4-Trimethylbenzene	1,000	10,000	NS	NS	NS	NS	31
1,3,5-Trimethylbenzene	10	100	NS	NS	NS	NS	16
pH	NA	NA	NA	NA	NA	NA	8.1
Reactivite Sulfide	NA	NA	NA	NA	NA	NA	<20
Reactive Cyanide	NA	NA	NA	NA	NA	NA	<4.0
Flashpoint	NA	NA	NA	NA	NA	NA	<212° F
TOC	NA	NA	NA	NA	NA	NA	1330
TPH (mg/kg)							
C_9-C_{36}	1,000	3,000	1000	1000	3000	3000	260
RCRA 8 Metals (mg/kg)							
Arsenic	20	20	20	20	20	20	<4.5
Barium	1,000	3,000	1000	1000	3000	3000	110
Cadmium	70	100	70	70	100	100	<0.45
Chromium	100	200	100	100	200	200	23
Lead	200	600	200	200	600	600	11
Mercury	20	30	20	20	30	30	<0.048
Selenium	400	700	400	400	700	700	<9.0
Silver	100	200	100	100	200	200	<0.90
PCBs (mg/kg)							
Aroclor-1016	1	4	1	1	4	4	<0.19
Aroclor-1221	1	4	1	1	4	4	<0.19
Aroclor-1232	1	4	1	1	4	4	<0.19
Aroclor-1242	1	4	1	1	4	4	<0.19
Aroclor-1248	1	4	1	1	4	4	<0.19
Aroclor-1254	1	4	1	1	4	4	<0.19
Aroclor-1260	1	4	1	1	4	4	<0.19
Aroclor-1262	1	4	1	1	4	4	<0.19
Aroclor-1268	1	4	1	1	4	4	<0.19

NA - Not analyzed or not applicable

NS - No standard has been developed

Boxed values indicate exceedance of Applicable Method 1 or RCS-1/2 Standard

1 - VOCs analyzed via low level 8260 analysis - only positive detections tabulated

Disp-1 is a composite sample

TABLE 3
Soil Gas Analytical Results
Former Racing Oil Site
178 Center Street
RTN 1-12664

Sample ID **Date Collected** **Units**	**Residential SV** µg/m^3	**Commercial/ Industrial SV** µg/m^3	**SG-1** **10/13/2016** µg/m^3	**SG-DUP** **10/13/2016** µg/m^3	**SG-2** **10/13/2016** µg/m^3
Air-phase Petroleum Hydrocarbons (APH)					
Benzene	160	770	<1.2	<1.2	<1.2
1,3-Butadiene	NA	NA	<0.83	<0.83	<0.83
Ethylbenzene	520	62,000	<1.6	<1.6	<1.6
Methyl tert-Butyl Ether (MTBE)	2,700	190,000	<1.4	<1.4	<1.4
Toluene	3,800	310,000	**4.0**	**3.6**	**4.1**
Naphthalene	42	190	<1.8	<1.8	<1.8
m & p - xylene	1,400	6,200	**2.7**	**2.4**	**2.6**
o-xylene	1,400	6,200	<1.5	<1.6	<1.6
C5-C8 Aliphatics	4,100	23,000	**150**	**96**	**190**
C9-C10 Aromatics	700	3,100	<19	<19	<19
C9-C12 Aliphatics	4,800	15,000	**54**	**61**	**47**

SV - Soil Gas Screening Values
NA - Not Applicable
Results given in µg/m^3
SG-DUP is a duplicate of sample SG-1

TABLE 4
Groundwater Analytical Results
181 Center Street
Chicopee, Massachusetts
RTN 1-12664

Sample ID	**TB-1-16**	**TB-2-16**	**MW-A**	**MW-B**	**CEA-1R**	**CEA-3**	**CEA-4**	**CEA-5**	**MW-SA-1**	**Dup-GW**	**Method 1 Standards (µg/L)**	
Date Collected	**11/03/16**	**11/03/16**	**11/03/16**	**11/03/16**	**11/03/16**	**11/03/16**	**11/03/16**	**11/03/16**	**11/04/16**	**11/04/16**	**GW-2**	**GW-3**
VPH Carbon Ranges (µg/L)												
C_5-C_8 Aliphatics	<100	<100	**450**	<100	**4700**	**1200**	**1500**	<100	**6100**	**5700**	3,000	50,000
C_9-C_{12} Aliphatics	<100	<100	**190**	<100	**3000**	**470**	**560**	<100	<1,000	<1000	5,000	50,000
C_9-C_{10} Aromatics	<100	<100	<100	<100	<1000	<100	<100	<100	**4700**	**4600**	4,000	50,000
Benzene	<1.0	<1.0	**1.1**	<1.0	**12**	**1.5**	**1.2**	<1.0	<10	<10	1,000	10,000
Ethylbenzene	<1.0	<1.0	**14**	<1.0	**160**	**180**	**120**	<1.0	**500**	**310**	20,000	5,000
Methyl-tert-butyl ether (MTBE)	<1.0	<1.0	**4.8**	<1.0	**12**	**5.2**	**2.6**	<1.0	<10	<10	50,000	50,000
Naphthalene	<5.0	<5.0	**5.9**	<5.0	**170**	**37**	**55**	<5.0	**170**	**140**	700	20,000
Toluene	<1.0	<1.0	<1.0	<1.0	**14**	**3.1**	**3.0**	<1.0	<10	<10	50,000	40,000
m&p-Xylenes	<2.0	<2.0	**26**	<2.0	**780**	**250**	**490**	<2.0	**2200**	**1400**	3,000	5,000
o-Xylene	<1.0	<1.0	<1.0	<1.0	**56**	**33**	**75**	<1.0	**69**	**41**	3,000	5,000

< indicates analyte was not detected above laboratory reporting limit shown.
Boxed values indicate exceedance of Applicable Method 1 standard
Dup-GW is a duplicate of MW-SA-1
Samples MW-SA-1 and Dup-GW were collected by EPA Lowflow methodology;
the remaining samples were collected using passive diffusion bags.

Appendix C

Table 4
Summary of Soil Analytical Data - Former UST Area
Racing Oil
Chicopee, Massachusetts

		SAMPLE LOCATION	B-1	B-1	B-2	B-2	B-3	B-3	B-4	B-4	B-5	B-5	B-6	B-6	B-7	B-8	B-8	B-9	B-10
		SAMPLE DEPTH (feet bgs)	13	23	15-16	23	13-15	20	12	15	12	18	9-10	15	6-7	6	10	7	6-7
		SAMPLE DATE	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/23/2013
		QC IDENTIFIER																	
PARAMETER	S-1/GW-2	S-1/GW-3																	
MADEP-EPH-04-1.1 (mg/kg)																			
C9 through C18 Aliphatic Hydrocarbons	1000	1000	28	ND (11)	34	ND (11)	100	ND (13)	ND (23)	ND (13)	ND (24)	ND (11)	ND (13)	ND (25)	ND (12)	1100	ND (26)	ND (26)	ND (11)
C19 through C36 Aliphatic Hydrocarbons	3000	3000	ND (25)	ND (11)	ND (12)	ND (11)	ND (24)	ND (13)	26	ND (13)	53	ND (11)	ND (13)	ND (25)	18	440	ND (26)	ND (26)	ND (11)
Unadjusted C11-C22 Aromatics	~	~	ND (25)	ND (11)	18	ND (11)	54	ND (13)	ND (23)	ND (13)	37	ND (11)	ND (13)	ND (25)	24	510	ND (26)	ND (26)	ND (11)
C11 through C22 Aromatic Hydrocarbons	1000	1000	ND (25)	ND (11)	16	ND (11)	45	ND (13)	ND (23)	ND (13)	37	ND (11)	ND (13)	ND (25)	24	510	ND (26)	ND (26)	ND (11)
Acenaphthene	1000	1000	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Acenaphthylene	600	10	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Anthracene	1000	1000	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Benzo(a)anthracene	7	7	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Benzo(a)pyrene	2	2	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Benzo(b)fluoranthene	7	7	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Benzo(g,h,i)perylene	1000	1000	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	0.14	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Benzo(k)fluoranthene	70	70	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Chrysene	70	70	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Dibenz(a,h)anthracene	0.7	0.7	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Fluoranthene	1000	1000	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Fluorene	1000	1000	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	0.22	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Indeno(1,2,3-cd)pyrene	7	7	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
2-Methylnaphthalene	80	300	0.95	ND (0.11)	1.5	ND (0.11)	5.2	ND (0.13)	ND (0.23)	ND (0.13)	0.37	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Naphthalene	40	500	0.58	ND (0.11)	1	ND (0.11)	3.7	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Phenanthrene	500	500	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	ND (0.12)	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
Pyrene	1000	1000	ND (0.25)	ND (0.11)	ND (0.12)	ND (0.11)	ND (0.24)	ND (0.13)	ND (0.23)	ND (0.13)	ND (0.24)	ND (0.11)	ND (0.13)	ND (0.25)	0.26	ND (0.12)	ND (0.26)	ND (0.26)	ND (0.11)
MADEP-VPH-04-1.1 (mg/kg)																			
Unadjusted C5-C8 Aliphatics	~	~	1700	ND (13)	870	ND (13)	510	ND (15)	100	ND (20)	7000	ND (11)	26	ND (21)	ND (22)	ND (17)	ND (18)	ND (20)	ND (14)
C5 through C8 Aliphatic Hydrocarbons	100	100	1700	ND (13)	870	ND (13)	510	ND (15)	100	ND (20)	7000	ND (11)	26	ND (21)	ND (22)	ND (17)	ND (18)	ND (20)	ND (14)
Unadjusted C9-C12 Aliphatics	~	~	1200	ND (13)	580	ND (13)	220	ND (15)	77	ND (20)	1700	ND (11)	65	ND (21)	ND (22)	ND (17)	ND (18)	ND (20)	ND (14)
C9 through C12 Aliphatic Hydrocarbons	1000	1000	560	ND (13)	280	ND (13)	110	ND (15)	50	ND (20)	1000	ND (11)	42	ND (21)	ND (22)	ND (17)	ND (18)	ND (20)	ND (14)
C9 through C10 Aromatic Hydrocarbons	100	100	610	ND (13)	290	ND (13)	100	ND (15)	22	ND (20)	660	ND (11)	19	ND (21)	ND (22)	ND (17)	ND (18)	ND (20)	ND (14)
Benzene	30	30	ND (0.83)	ND (0.063)	ND (0.78)	ND (0.063)	ND (0.3)	ND (0.075)	ND (0.065)	ND (0.1)	ND (3)	ND (0.056)	ND (0.073)	ND (0.11)	ND (0.11)	ND (0.086)	ND (0.09)	ND (0.1)	ND (0.07)
Ethylbenzene	500	500	ND (0.83)	ND (0.063)	ND (0.78)	ND (0.063)	0.6	ND (0.075)	0.12	ND (0.1)	ND (3)	ND (0.056)	0.3	ND (0.11)	ND (0.11)	ND (0.086)	ND (0.09)	ND (0.1)	ND (0.07)
Methyl tert-butyl ether	100	100	ND (0.83)	ND (0.063)	ND (0.78)	ND (0.063)	ND (0.3)	ND (0.075)	ND (0.065)	ND (0.1)	ND (3)	ND (0.056)	ND (0.073)	ND (0.11)	ND (0.11)	ND (0.086)	ND (0.09)	ND (0.1)	ND (0.07)
Naphthalene	40	500	ND (4.1)	ND (0.31)	ND (3.9)	ND (0.31)	ND (1.5)	ND (0.37)	ND (0.32)	ND (0.51)	ND (15)	ND (0.28)	ND (0.36)	ND (0.53)	ND (0.55)	ND (0.43)	ND (0.45)	ND (0.5)	ND (0.35)
Toluene	500	500	1.1	ND (0.063)	ND (0.78)	ND (0.063)	ND (0.3)	ND (0.075)	ND (0.065)	ND (0.1)	3.3	ND (0.056)	ND (0.073)	ND (0.11)	ND (0.11)	ND (0.086)	ND (0.09)	ND (0.1)	ND (0.07)
m,p-Xylene	300	500	ND (1.7)	ND (0.13)	ND (1.6)	ND (0.13)	ND (0.59)	ND (0.15)	ND (0.13)	ND (0.2)	ND (6)	ND (0.11)	0.24	ND (0.21)	ND (0.22)	ND (0.17)	ND (0.18)	ND (0.2)	ND (0.14)
o-Xylene	300	500	18	ND (0.063)	11	ND (0.063)	3.3	ND (0.075)	4.4	ND (0.1)	40	ND (0.056)	3.9	0.26	0.14	ND (0.086)	ND (0.09)	ND (0.1)	ND (0.07)
SW-846 6010C (mg/kg)																			
Antimony	~	20	ND (3)	ND (2.6)	ND (2.9)	ND (2.6)	ND (2.8)	ND (3)	ND (2.7)	ND (3.2)	ND (2.8)	ND (2.7)	ND (3.2)	ND (3)	ND (2.8)	ND (2.9)	ND (3.3)	ND (3.4)	ND (2.8)
Arsenic	~	20	ND (3)	ND (2.6)	ND (2.9)	ND (2.6)	ND (2.8)	ND (3)	ND (2.7)	ND (3.2)	ND (2.8)	ND (2.7)	ND (3.2)	ND (3)	ND (2.8)	ND (2.9)	ND (3.3)	ND (3.4)	ND (2.8)
Barium	~	1000	38	64	21	70	51	110	36	170	30	90	27	180	27	32	170	160	53
Beryllium	~	100	ND (0.3)	ND (0.26)	ND (0.29)	ND (0.26)	ND (0.28)	ND (0.3)	ND (0.27)	ND (0.32)	ND (0.28)	ND (0.27)	ND (0.32)	ND (0.3)	ND (0.28)	ND (0.29)	ND (0.33)	ND (0.34)	ND (0.28)
Cadmium	~	2	ND (0.3)	ND (0.26)	ND (0.29)	ND (0.26)	ND (0.28)	ND (0.3)	ND (0.27)	ND (0.32)	ND (0.28)	ND (0.27)	ND (0.32)	0.33	ND (0.28)	ND (0.29)	ND (0.33)	ND (0.34)	ND (0.28)
Chromium	~	30	9.4	13	5.6	13	10	25	10	37	8.2	21	7.7	37	8.5	11	38	35	11
Copper	~	~	9.6	8.3	5.8	11	10	18	9.4	27	7.7	14	7	24	6.7	7.7	27	22	10
Lead	~	300	3.4	3.8	2.9	4	3.6	6.7	4.1	10	13	6.3	4.2	8.3	1.8	3.3	8.8	8.9	5.9
Nickel	~	20	10	9.3	7.2	11	10	19	10	27	8.6	15	8.9	27	6.7	11	28	27	11
Selenium	~	400	ND (5.9)	ND (5.2)	ND (5.9)	ND (5.1)	ND (5.7)	ND (6.1)	ND (5.4)	ND (6.3)	ND (5.7)	ND (5.3)	ND (6.4)	ND (6)	ND (5.7)	ND (5.7)	ND (6.7)	ND (6.8)	ND (5.5)
Silver	~	100	ND (0.59)	ND (0.52)	ND (0.59)	ND (0.51)	1	0.64	ND (0.54)	ND (1.2)	ND (0.57)	ND (0.53)	ND (0.64)	ND (0.6)	ND (0.57)	ND (0.57)	ND (0.67)	ND (0.68)	ND (0.55)
Thallium	~	8	ND (3)	ND (2.6)	ND (2.9)	ND (2.6)	ND (2.8)	ND (3)	ND (2.7)	ND (3.2)	ND (2.8)	ND (2.7)	ND (3.2)	ND (3)	ND (2.8)	ND (2.9)	ND (3.3)	ND (3.4)	ND (2.8)
Vanadium	~	600	16	19	9	22	19	38	16	59	13	36	14	65	13	16	65	59	19
Zinc	~	2500	21	18	14	23	24	42	29	67	27	35	48	68	18	23	72	67	46
SW-846 7471B (mg/kg)																			
Mercury	~	20	ND (0.032)	ND (0.027)	ND (0.03)	ND (0.027)	0.029	0.032	0.028	ND (0.033)	ND (0.03)	ND (0.028)	ND (0.033)	ND (0.032)	0.029	ND (0.03)	ND (0.033)	ND (0.034)	ND (0.028)
SW-846 8260C (mg/kg)																			
Acetone	50	400	ND (41)	ND (0.11)	ND (41)	ND (0.11)	ND (7.9)	ND (0.13)	ND (3.6)	ND (0.12)	ND (71)	ND (0.11)	ND (0.12)	ND (0.13)	ND (0.12)	ND (0.12)	ND (0.13)	ND (0.14)	ND (0.11)
tert-Amyl Methyl Ether (TAME)	~	~	ND (0.41)	ND (0.0011)	ND (0.41)	ND (0.0011)	ND (0.079)	0.0016	ND (0.036)	ND (0.0012)	ND (0.71)	ND (0.0011)	ND (0.0012)	ND (0.0013)	ND (0.0012)	ND (0.0012)	ND (0.0013)	ND (0.0014)	ND (0.0011)
Benzene	30	30	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)

Table 4
Summary of Soil Analytical Data - Former UST Area
Racing Oil
Chicopee, Massachusetts

	SAMPLE LOCATION		B-1	B-1	B-2	B-2	B-3	B-3	B-4	B-4	B-5	B-5	B-6	B-6	B-7	B-8	B-8	B-9	B-10
	SAMPLE DEPTH (feet bgs)		13	23	15-16	23	13-15	20	12	15	12	18	9-10	15	6-7	6	10	7	6-7
	SAMPLE DATE		1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/23/2013
	QC IDENTIFIER																		
PARAMETER	S-1/GW-2	S-1/GW-3																	
Bromobenzene	~	~	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Bromochloromethane	~	~	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Bromodichloromethane	0.1	20	**ND (0.81)**	ND (0.0021)	**ND (0.81)**	ND (0.0022)	**ND (0.16)**	ND (0.0026)	ND (0.072)	ND (0.0023)	**ND (1.4)**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Bromoform	1	200	**ND (4.1)**	ND (0.011)	**ND (4.1)**	ND (0.011)	ND (0.79)	ND (0.013)	ND (0.36)	ND (0.012)	**ND (7.1)**	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
Bromomethane	0.5	30	**ND (1.6)**	ND (0.011)	**ND (1.6)**	ND (0.011)	ND (0.31)	ND (0.013)	ND (0.14)	ND (0.012)	**ND (2.8)**	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
2-Butanone	50	400	ND (16)	ND (0.043)	ND (16)	ND (0.044)	ND (3.1)	ND (0.053)	ND (1.4)	ND (0.047)	ND (28)	ND (0.045)	ND (0.048)	ND (0.052)	ND (0.048)	ND (0.049)	ND (0.054)	ND (0.055)	ND (0.046)
n-Butylbenzene	~	~	**13**	ND (0.0021)	**16**	ND (0.0022)	**6.2**	ND (0.0026)	**0.095**	ND (0.0023)	**36**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
sec-Butylbenzene	~	~	**2**	ND (0.0021)	**2.7**	ND (0.0022)	**1**	ND (0.0026)	ND (0.072)	ND (0.0023)	**5.9**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
tert-Butylbenzene	~	~	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
tert-Butyl Ethyl Ether (TBEE)	~	~	ND (0.41)	ND (0.0021)	ND (0.41)	ND (0.0022)	ND (0.079)	ND (0.0026)	ND (0.036)	ND (0.0023)	ND (0.71)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Carbon Disulfide	~	~	ND (8.1)	ND (0.0064)	ND (8.1)	ND (0.0066)	ND (1.6)	ND (0.0079)	ND (0.72)	ND (0.007)	ND (14)	ND (0.0067)	ND (0.0072)	ND (0.0078)	ND (0.0072)	ND (0.0073)	ND (0.0081)	ND (0.0082)	ND (0.0069)
Carbon tetrachloride	5	10	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Chlorobenzene	3	100	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Dibromochloromethane	0.03	20	**ND (1.6)**	ND (0.011)	**ND (1.6)**	ND (0.011)	**ND (0.31)**	ND (0.013)	**ND (0.14)**	ND (0.012)	**ND (2.8)**	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
Chloroethane	~	~	ND (1.6)	ND (0.011)	ND (1.6)	ND (0.011)	ND (0.31)	ND (0.013)	ND (0.14)	ND (0.012)	ND (2.8)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
Chloroform	0.3	400	**ND (1.6)**	ND (0.0043)	**ND (1.6)**	ND (0.0044)	0.34	ND (0.0053)	ND (0.14)	ND (0.0047)	**ND (2.8)**	ND (0.0045)	ND (0.0048)	ND (0.0052)	ND (0.0048)	ND (0.0049)	ND (0.0054)	ND (0.0055)	ND (0.0046)
Chloromethane	~	~	ND (1.6)	ND (0.011)	ND (1.6)	ND (0.011)	ND (0.31)	ND (0.013)	ND (0.14)	ND (0.012)	ND (2.8)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
2-Chlorotoluene	~	~	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
4-Chlorotoluene	~	~	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,2-Dibromo-3-chloropropane (DBCP)	~	~	ND (4.1)	ND (0.0043)	ND (4.1)	ND (0.0044)	ND (0.79)	ND (0.0053)	ND (0.36)	ND (0.0047)	ND (7.1)	ND (0.0045)	ND (0.0048)	ND (0.0052)	ND (0.0048)	ND (0.0049)	ND (0.0054)	ND (0.0055)	ND (0.0046)
1,2-Dibromoethane	0.1	0.7	**ND (0.41)**	ND (0.0011)	**ND (0.41)**	ND (0.0011)	ND (0.079)	ND (0.013)	ND (0.036)	ND (0.0012)	**ND (0.71)**	ND (0.0011)	ND (0.0012)	ND (0.0013)	ND (0.0012)	ND (0.0012)	ND (0.0013)	ND (0.0014)	ND (0.0011)
Dibromomethane	~	~	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,2-Dichlorobenzene	30	300	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,3-Dichlorobenzene	40	100	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,4-Dichlorobenzene	4	50	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Dichlorodifluoromethane (Freon 12)	~	~	ND (1.6)	ND (0.011)	ND (1.6)	ND (0.011)	ND (0.31)	ND (0.013)	ND (0.14)	ND (0.012)	ND (2.8)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
1,1-Dichloroethane	5	500	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,2-Dichloroethane	0.1	10	**ND (0.81)**	ND (0.0021)	**ND (0.81)**	ND (0.0022)	**ND (0.16)**	ND (0.0026)	ND (0.072)	ND (0.0023)	**ND (1.4)**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,1-Dichloroethene	40	500	ND (0.81)	ND (0.0043)	ND (0.81)	ND (0.0044)	ND (0.16)	ND (0.0053)	ND (0.072)	ND (0.0047)	ND (1.4)	ND (0.0045)	ND (0.0048)	ND (0.0052)	ND (0.0048)	ND (0.0049)	ND (0.0054)	ND (0.0055)	ND (0.0046)
cis-1,2-Dichloroethene	0.4	100	**ND (0.81)**	ND (0.0021)	**ND (0.81)**	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	**ND (1.4)**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
trans-1,2-Dichloroethene	1	500	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	**ND (1.4)**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,2-Dichloropropane	0.1	10	**ND (0.81)**	ND (0.0021)	**ND (0.81)**	ND (0.0022)	**ND (0.16)**	ND (0.0026)	ND (0.072)	ND (0.0023)	**ND (1.4)**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,3-Dichloropropane	~	~	ND (0.41)	ND (0.0011)	ND (0.81)	ND (0.0011)	ND (0.079)	ND (0.0013)	ND (0.036)	ND (0.0012)	ND (0.71)	ND (0.0011)	ND (0.0012)	ND (0.0013)	ND (0.0012)	ND (0.0012)	ND (0.0013)	ND (0.0014)	ND (0.0011)
2,2-Dichloropropane	~	~	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,1-Dichloropropene	~	~	ND (1.6)	ND (0.0021)	ND (1.6)	ND (0.0022)	ND (0.31)	ND (0.0026)	ND (0.14)	ND (0.0023)	ND (2.8)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
cis-1,3-Dichloropropene	~	~	ND (0.81)	ND (0.011)	ND (0.81)	ND (0.011)	ND (0.16)	ND (0.013)	ND (0.072)	ND (0.012)	ND (1.4)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
trans-1,3-Dichloropropene	~	~	ND (1.6)	ND (0.011)	ND (1.6)	ND (0.011)	ND (0.31)	ND (0.013)	ND (0.14)	ND (0.012)	ND (2.8)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
Diethyl Ether	~	~	ND (1.6)	ND (0.011)	ND (1.6)	ND (0.011)	ND (0.31)	ND (0.013)	ND (0.14)	ND (0.012)	ND (2.8)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
Diisopropyl Ether (DIPE)	~	~	ND (0.41)	ND (0.0011)	ND (0.41)	ND (0.0011)	ND (0.079)	ND (0.0013)	ND (0.036)	ND (0.0012)	ND (0.71)	ND (0.0011)	ND (0.0012)	ND (0.0013)	ND (0.0012)	ND (0.0012)	ND (0.0013)	ND (0.0014)	ND (0.0011)
1,4-Dioxane	6	70	**ND (41)**	ND (0.11)	**ND (41)**	ND (0.011)	**ND (7.9)**	ND (0.13)	ND (3.6)	ND (0.12)	**ND (71)**	ND (0.11)	ND (0.12)	ND (0.13)	ND (0.12)	ND (0.12)	ND (0.13)	ND (0.14)	ND (0.011)
Ethylbenzene	500	500	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Hexachlorobutadiene	6	6	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
2-Hexanone (MBK)	~	~	ND (8.1)	ND (0.021)	ND (8.1)	ND (0.022)	ND (1.6)	ND (0.026)	ND (0.72)	ND (0.023)	ND (14)	ND (0.022)	ND (0.024)	ND (0.026)	ND (0.024)	ND (0.024)	ND (0.027)	ND (0.027)	ND (0.023)
Isopropylbenzene (Cumene)	~	~	ND (0.81)	ND (0.0021)	**1.7**	ND (0.0022)	**0.32**	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
p-Isopropyltoluene (p-Cymene)	~	~	**1.7**	ND (0.0021)	**2.1**	ND (0.0022)	**0.79**	ND (0.0026)	ND (0.072)	ND (0.0023)	**5.8**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Methyl tert-butyl ether	100	100	ND (0.81)	ND (0.0043)	ND (0.81)	ND (0.0044)	ND (0.16)	**0.019**	ND (0.072)	ND (0.0047)	ND (1.4)	ND (0.0045)	ND (0.0048)	**0.03**	ND (0.0048)	ND (0.0049)	ND (0.0054)	ND (0.0055)	ND (0.0046)
Methylene chloride	20	200	ND (4.1)	ND (0.011)	ND (4.1)	ND (0.011)	ND (0.79)	ND (0.013)	ND (0.36)	ND (0.012)	ND (7.1)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
4-Methyl-2-pentanone	50	400	ND (8.1)	ND (0.021)	ND (8.1)	ND (0.022)	ND (1.6)	ND (0.026)	ND (0.72)	ND (0.023)	ND (14)	ND (0.022)	ND (0.024)	ND (0.026)	ND (0.024)	ND (0.024)	ND (0.027)	ND (0.027)	ND (0.023)
Naphthalene	40	500	ND (4.1)	ND (0.0043)	ND (4.1)	ND (0.0044)	ND (0.79)	ND (0.0053)	ND (0.36)	ND (0.0047)	ND (7.1)	ND (0.0045)	ND (0.0048)	ND (0.0052)	ND (0.0048)	**0.007**	ND (0.0054)	ND (0.0055)	ND (0.0046)
n-Propylbenzene	~	~	**4.8**	ND (0.0021)	**9.7**	ND (0.0022)	**2.4**	ND (0.0026)	ND (0.072)	ND (0.0023)	**2.7**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Styrene	4	30	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,1,1,2-Tetrachloroethane	0.1	7	**ND (1.6)**	ND (0.011)	**ND (1.6)**	ND (0.011)	**ND (0.31)**	ND (0.013)	**ND (0.14)**	ND (0.012)	**ND (2.8)**	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
1,1,2,2-Tetrachloroethane	0.02	0.8	**ND (0.41)**	ND (0.0011)	**ND (0.41)**	ND (0.0011)	**ND (0.079)**	ND (0.0013)	**ND (0.036)**	ND (0.0012)	**ND (0.71)**	ND (0.0011)	ND (0.0012)	ND (0.0013)	ND (0.0012)	ND (0.0012)	ND (0.0013)	ND (0.0014)	ND (0.0011)
Tetrachloroethene	10	30	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Tetrahydrofuran	~	~	ND (3.2)	ND (0.011)	ND (3.3)	ND (0.011)	ND (0.63)	ND (0.013)	ND (0.29)	ND (0.012)	ND (5.7)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
Toluene	500	500	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)

Table 4
Summary of Soil Analytical Data - Former UST Area
Racing Oil
Chicopee, Massachusetts

		SAMPLE LOCATION	B-1	B-1	B-2	B-2	B-3	B-3	B-4	B-4	B-5	B-5	B-6	B-6	B-7	B-8	B-8	B-9	B-10
		SAMPLE DEPTH (feet bgs)	13	23	15-16	23	13-15	20	12	15	12	18	9-10	15	6-7	6	10	7	6-7
		SAMPLE DATE	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/22/2013	1/23/2013
		QC IDENTIFIER																	
PARAMETER	S-1/GW-2	S-1/GW-3																	
1,2,3-Trichlorobenzene	~	~	ND (4.1)	ND (0.0021)	ND (4.1)	ND (0.0022)	ND (0.79)	ND (0.0026)	ND (0.36)	ND (0.0023)	ND (7.1)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,2,4-Trichlorobenzene	70	500	ND (4.1)	ND (0.0021)	ND (4.1)	ND (0.0022)	ND (0.79)	ND (0.0026)	ND (0.36)	ND (0.0023)	ND (7.1)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,1,1-Trichloroethane	500	500	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,1,2-Trichloroethane	2	4	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Trichloroethene	2	90	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Trichlorofluoromethane (Freon 11)	~	~	ND (1.6)	ND (0.011)	ND (1.6)	ND (0.011)	ND (0.31)	ND (0.013)	ND (0.14)	ND (0.012)	ND (2.8)	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
1,2,3-Trichloropropane	~	~	ND (1.6)	ND (0.0021)	ND (1.6)	ND (0.0022)	ND (0.31)	ND (0.0026)	ND (0.14)	ND (0.0023)	ND (2.8)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,2,4-Trimethylbenzene	~	~	**34**	**0.016**	**54**	ND (0.0022)	**8.7**	ND (0.0026)	ND (0.072)	ND (0.0023)	**2**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
1,3,5-Trimethylbenzene	~	~	**18**	**0.005**	**25**	ND (0.0022)	**4.8**	ND (0.0026)	ND (0.072)	ND (0.0023)	**4.9**	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
Vinyl chloride	0.6	0.6	**ND (1.6)**	ND (0.011)	**ND (1.6)**	ND (0.011)	ND (0.31)	ND (0.013)	ND (0.14)	ND (0.012)	**ND (2.8)**	ND (0.011)	ND (0.012)	ND (0.013)	ND (0.012)	ND (0.012)	ND (0.013)	ND (0.014)	ND (0.011)
m,p-Xylene	300	500	ND (1.6)	ND (0.0043)	ND (1.6)	ND (0.0044)	**0.32**	ND (0.0053)	ND (0.14)	ND (0.0047)	ND (2.8)	ND (0.0045)	ND (0.0048)	ND (0.0052)	ND (0.0048)	ND (0.0049)	ND (0.0054)	ND (0.0055)	ND (0.0046)
o-Xylene	300	500	ND (0.81)	ND (0.0021)	ND (0.81)	ND (0.0022)	ND (0.16)	ND (0.0026)	ND (0.072)	ND (0.0023)	ND (1.4)	ND (0.0022)	ND (0.0024)	ND (0.0026)	ND (0.0024)	ND (0.0024)	ND (0.0027)	ND (0.0027)	ND (0.0023)
SM 2540G (% weight)																			
% Solids	~	~	**78.3**	**93.1**	**83.4**	**91.2**	**83.4**	**76.1**	**86.3**	**74.5**	**82.3**	**88.9**	**74.6**	**76.9**	**83.2**	**82.2**	**74.4**	**73.3**	**87.5**

NOTES:
1. ND = Not detected above the lab reporting limits shown in parenthesis.
2. NT = Not tested.
3. ~ = No regulatory limits available
4. Gray shaded values represent positive detections below Method 1 risk assessment standards.
5. Black shaded values exceed Method 1 risk assessment standards for S-1/GW-2 or S-1/GW-3 soil.

Appendix D

Construction Worker - Soil: Table CW-1
Exposure Point Concentration (EPC) and Risk
Based on Construction Worker 18-25 years of age

ShortForm Version 10-12
Vlookup Version v0315

ELCR (all chemicals) = 2.8E-08
HI (all chemicals) = 2.6E-02

****Do not insert or delete any rows****
Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material (OHM)		EPC (mg/kg)	ELCR ingestion	ELCR dermal	ELCR inhalation GI	ELCR inhalation pulmonary	$ELCR_{total}$	Subchronic HQ_{ing}	Subchronic HQ_{derm}	Subchronic HQ_{inh-GI}	Subchronic HQ_{inh}	Subchronic HQ_{total}
ALIPHATICS	C5 to C8	6.4E+02						2.0E-03	4.0E-03	5.1E-05	1.2E-04	6.1E-03
ALIPHATICS	C9 to C12	4.3E+02						5.3E-04	1.1E-03	1.4E-05	2.7E-05	1.6E-03
AROMATICS	C9 to C10	2.1E+02						8.5E-04	1.7E-03	2.2E-05	1.5E-05	2.6E-03
ALIPHATICS	C9 to C18	3.6E+01						4.4E-05	8.9E-05	1.1E-06	2.2E-06	1.4E-04
ALIPHATICS	C19 to C36	1.3E+01						2.6E-06	5.2E-06	6.7E-08		7.9E-06
AROMATICS	C11 to C22	1.8E+01						2.3E-05	7.6E-05	5.8E-07	1.4E-06	1.0E-04
METHYLNAPHTHALENE, 2-		1.7E+00						1.6E-04	5.2E-04	4.0E-06	1.3E-07	6.8E-04
NAPHTHALENE		1.2E+00						2.2E-06	7.5E-06	5.8E-08	1.5E-05	2.5E-05
ETHYLBENZENE		3.7E-01						9.1E-06	2.8E-06	2.4E-07	1.5E-09	1.2E-05
TOLUENE		3.4E-01						5.2E-07	1.6E-07	1.4E-08	2.5E-09	7.0E-07
XYLENES (Mixed Isomers)		4.9E-01						1.5E-06	4.6E-07	3.9E-08	4.6E-08	2.0E-06
XYLENES (Mixed Isomers)		8.1E+00						2.5E-05	7.6E-06	6.5E-07	7.6E-07	3.4E-05
CHLOROFORM		0.4				2.4E-12	2.4E-12	4.9E-05	1.5E-05	1.3E-06	2.3E-08	6.5E-05
BARIUM		34.6						6.1E-04	6.1E-04	1.6E-05	2.6E-04	1.5E-03
CHROMIUM (TOTAL)		8.54				2.7E-08	2.7E-08	5.3E-04	5.3E-04	1.4E-05	1.1E-03	2.1E-03
NICKEL		9.22				1.2E-09	1.2E-09	5.7E-04	1.1E-03	1.5E-05	3.4E-04	2.1E-03
LEAD		3.64						3.0E-03	3.6E-04	7.7E-05	1.4E-04	3.6E-03
VANADIUM		14.8						2.0E-03	2.0E-03	5.2E-05	5.5E-04	4.7E-03
SILVER		0.44						1.1E-04	3.3E-04	2.8E-06	1.2E-04	5.6E-04

Note! Cr(VI) limit is 200 mg/kg due to contact dermititis.

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Park Visitor - Soil: Table PS-1
Exposure Point Concentration (EPC)
Based on Visitor Ages 1-31 (Cancer), 1-8 (Chronic Noncancer), and 1-2 (Subchronic Noncancer)

ShortForm Version 10-12

Vlookup Version v0315

ELCR (all chemicals) =

Chronic HI (all chemicals) = 1.3E-01

Subchronic HI (all chemicals) = 5.8E-02

****Do not insert or delete any rows****

Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material	EPC (mg/kg)	$ELCR_{ingestion}$	$ELCR_{dermal}$	$ELCR_{total}$	Chronic			Subchronic			
					HQ_{ing}	HQ_{derm}	HQ_{total}	HQ_{ing}	HQ_{derm}	HQ_{total}	
ALIPHATICS C5 to C8	6.4E+02				2.3E-02	4.0E-02	6.3E-02	6.4E-03	7.5E-03	1.4E-02	
ALIPHATICS C9 to C12	4.3E+02				6.2E-03	1.1E-02	1.7E-02	1.7E-03	2.0E-03	3.7E-03	
AROMATICS C9 to C10	2.1E+02				1.0E-02	1.7E-02	2.7E-02	2.8E-03	3.2E-03	6.0E-03	
ALIPHATICS C9 to C18	3.6E+01				5.2E-04	8.9E-04	1.4E-03	1.4E-04	1.7E-04	3.1E-04	
ALIPHATICS C19 to C36	1.3E+01				9.2E-06	1.6E-05	2.5E-05	8.4E-06	9.8E-06	1.8E-05	
AROMATICS C11 to C22	1.8E+01				2.7E-04	7.5E-04	1.0E-03	7.3E-05	1.4E-04	2.2E-04	
METHYLNAPHTHALENE, 2-	1.7E+00				1.8E-04	5.2E-04	7.0E-04	5.0E-04	9.8E-04	1.5E-03	
NAPHTHALENE	1.2E+00				2.6E-05	7.5E-05	1.0E-04	7.3E-06	1.4E-05	2.1E-05	
ETHYLBENZENE	3.7E-01				1.1E-05	2.7E-06	1.3E-05	3.0E-05	5.2E-06	3.5E-05	
TOLUENE	3.4E-01				6.2E-06	1.6E-06	7.8E-06	1.7E-06	3.0E-07	2.0E-06	
XYLENES (Mixed Isomers)	4.9E-01				3.6E-06	9.1E-07	4.5E-06	4.9E-06	8.6E-07	5.8E-06	
XYLENES (Mixed Isomers)	8.1E+00				5.9E-05	1.5E-05	7.4E-05	8.1E-05	1.4E-05	9.5E-05	
CHLOROFORM	0.4				5.8E-05	1.5E-05	7.3E-05	1.6E-04	2.8E-05	1.9E-04	
BARIUM	34.6				2.5E-04	2.1E-04	4.7E-04	2.0E-03	1.2E-03	3.1E-03	
CHROMIUM (TOTAL)	8.54				4.1E-03	3.5E-03	7.7E-03	1.7E-03	1.0E-03	2.7E-03	Note! Cr(VI) limit is 200 mg/kg due to contact dermiti
NICKEL	9.22				6.7E-04	1.1E-03	1.8E-03	1.8E-03	2.2E-03	4.0E-03	
LEAD	3.64				3.5E-03	3.6E-04	3.9E-03	9.7E-03	6.8E-04	1.0E-02	Note! Lead IH HQ limit is 1, not 10.
VANADIUM	14.8				2.4E-03	2.0E-03	4.4E-03	6.6E-03	3.8E-03	1.0E-02	
SILVER	0.44				1.3E-04	3.3E-04	4.5E-04	3.5E-04	6.2E-04	9.7E-04	

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Resident - Soil: Table RS-1
Exposure Point Concentration (EPC)
Based on Resident Ages 1-31 (Cancer), 1-8 (Chronic Noncancer), and 1-2 (Subchronic Noncancer)

ShortForm Version 10-12
Vlookup Versionv0315

ELCR (all chemicals) =
Chronic HI (all chemicals) = 2.2E-01
Subchronic HI (all chemicals) = 9.6E-02

Do not insert or delete any rows
Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material		EPC (mg/kg)	$ELCR_{ingestion}$	$ELCR_{dermal}$	Derm & Ing $ELCR_{total}$	Chronic HQ_{ing}	Chronic HQ_{derm}	Derm & Ing HQ_{total}	Subchronic HQ_{ing}	Subchronic HQ_{derm}	Derm & Ing HQ_{total}	
ALIPHATICS	C5 to C8	6.4E+02				3.9E-02	6.6E-02	1.0E-01	1.1E-02	1.3E-02	2.3E-02	
ALIPHATICS	C9 to C12	4.3E+02				1.0E-02	1.8E-02	2.8E-02	2.9E-03	3.3E-03	6.2E-03	
AROMATICS	C9 to C10	2.1E+02				1.7E-02	2.9E-02	4.5E-02	4.6E-03	5.4E-03	1.0E-02	
ALIPHATICS	C9 to C18	3.6E+01				8.7E-04	1.5E-03	2.4E-03	2.4E-04	2.8E-04	5.2E-04	
ALIPHATICS	C19 to C36	1.3E+01				1.5E-05	2.6E-05	4.1E-05	1.4E-05	1.6E-05	3.0E-05	
AROMATICS	C11 to C22	1.8E+01				4.4E-04	1.3E-03	1.7E-03	1.2E-04	2.4E-04	3.6E-04	
METHYLNAPHTHALENE, 2-		1.7E+00				3.1E-04	8.7E-04	1.2E-03	8.4E-04	1.6E-03	2.5E-03	
NAPHTHALENE		1.2E+00				4.4E-05	1.2E-04	1.7E-04	1.2E-05	2.4E-05	3.6E-05	
ETHYLBENZENE		3.7E-01				1.8E-05	4.6E-06	2.3E-05	4.9E-05	8.7E-06	5.8E-05	
TOLUENE		3.4E-01				1.0E-05	2.6E-06	1.3E-05	2.8E-06	5.0E-07	3.3E-06	
XYLENES (Mixed Isomers)		4.9E-01				5.9E-06	1.5E-06	7.5E-06	8.2E-06	1.4E-06	9.6E-06	
XYLENES (Mixed Isomers)		8.1E+00				9.8E-05	2.5E-05	1.2E-04	1.4E-04	2.4E-05	1.6E-04	
CHLOROFORM		0.4				9.7E-05	2.5E-05	1.2E-04	2.7E-04	4.7E-05	3.1E-04	
BARIUM		34.6				4.2E-04	3.6E-04	7.8E-04	3.3E-03	1.9E-03	5.2E-03	
CHROMIUM (TOTAL)		8.54				6.9E-03	5.9E-03	1.3E-02	2.8E-03	1.7E-03	4.5E-03	Note! Cr(VI) limit is 200 mg/kg due to contact dermititis.
NICKEL		9.22				1.1E-03	1.9E-03	3.0E-03	3.1E-03	3.6E-03	6.7E-03	
LEAD		3.64				5.9E-03	6.0E-04	6.5E-03	1.6E-02	1.1E-03	1.7E-02	Note! Lead IH HQ limit is 1, not 10.
VANADIUM		14.8				4.0E-03	3.4E-03	7.4E-03	1.1E-02	6.4E-03	1.7E-02	
SILVER		0.44				2.1E-04	5.4E-04	7.6E-04	5.9E-04	1.0E-03	1.6E-03	

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Trespasser - Soil: Table TS-1
Exposure Point Concentration (EPC)
Based on Trespasser Ages 11-18 (Cancer and Non-Cancer)

ShortForm Version 10-12

Vlookup Version v0315

ELCR (all chemicals) =

Chronic HI (all chemicals) = 1.4E-02

Subchronic HI (all chemicals) = 5.5E-03

****Do not insert or delete any rows****

Click on empty cell below and select OHM using arrow.

Oil or Hazardous Material	EPC (mg/kg)	$ELCR_{ingestion}$	$ELCR_{dermal}$	$ELCR_{total}$	Chronic HQ_{ing}	Chronic HQ_{derm}	Chronic HQ_{total}	Subchronic HQ_{ing}	Subchronic HQ_{derm}	Subchronic HQ_{total}
ALIPHATICS C5 to C8	6.4E+02				2.6E-03	4.3E-03	6.9E-03	5.7E-04	7.9E-04	1.4E-03
ALIPHATICS C9 to C12	4.3E+02				6.9E-04	1.1E-03	1.8E-03	1.5E-04	2.1E-04	3.6E-04
AROMATICS C9 to C10	2.1E+02				1.1E-03	1.8E-03	3.0E-03	2.5E-04	3.4E-04	5.9E-04
ALIPHATICS C9 to C18	3.6E+01				5.8E-05	9.6E-05	1.5E-04	1.3E-05	1.8E-05	3.0E-05
ALIPHATICS C19 to C36	1.3E+01				1.0E-06	1.7E-06	2.7E-06	7.4E-07	1.0E-06	1.8E-06
AROMATICS C11 to C22	1.8E+01				3.0E-05	8.1E-05	1.1E-04	6.5E-06	1.5E-05	2.1E-05
METHYLNAPHTHALENE, 2-	1.7E+00				2.0E-05	5.6E-05	7.6E-05	4.5E-05	1.0E-04	1.5E-04
NAPHTHALENE	1.2E+00				2.9E-06	8.1E-06	1.1E-05	6.4E-07	1.5E-06	2.1E-06
ETHYLBENZENE	3.7E-01				1.2E-06	3.0E-07	1.5E-06	2.6E-06	5.5E-07	3.2E-06
TOLUENE	3.4E-01				6.9E-07	1.7E-07	8.6E-07	1.5E-07	3.1E-08	1.8E-07
XYLENES (Mixed Isomers)	4.9E-01				4.0E-07	9.8E-08	4.9E-07	4.3E-07	9.0E-08	5.2E-07
XYLENES (Mixed Isomers)	8.1E+00				6.6E-06	1.6E-06	8.2E-06	7.2E-06	1.5E-06	8.7E-06
CHLOROFORM	0.4				6.5E-06	1.6E-06	8.1E-06	1.4E-05	2.9E-06	1.7E-05
BARIUM	34.6				2.8E-05	2.3E-05	5.1E-05	1.8E-04	1.2E-04	3.0E-04
CHROMIUM (TOTAL)	8.54				4.6E-04	3.8E-04	8.4E-04	1.5E-04	1.0E-04	2.6E-04
NICKEL	9.22				7.5E-05	1.2E-04	2.0E-04	1.6E-04	2.3E-04	3.9E-04
LEAD	3.64				3.9E-04	3.9E-05	4.3E-04	8.6E-04	7.2E-05	9.3E-04
VANADIUM	14.8				2.7E-04	2.2E-04	4.9E-04	5.8E-04	4.0E-04	9.9E-04
SILVER	0.44				1.4E-05	3.5E-05	4.9E-05	3.1E-05	6.5E-05	9.6E-05

Note! Cr(VI) limit is 200 mg/kg due to contact dermititis.

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Appendix E

TABLE E-1
Comprehensive Analysis of Alternatives
Former Racing Oil Site
181 Center Street, Chicopee

		Monitored Natural Attenuation	Soil Excavation w/Offsite Disposal (1)
Effectiveness			
	Protectiveness		
	Protective of public health & community	2	3
	Protective of workers during implementation	3	2
	Protective of environment	1	3
	Complies with ARARs	2	2
	Ability to Achieve Removal Objectives		
	Level of treatment/containment expected	1	2
	No residual effects concerns	1	2
	Will maintain control until long-term solution implemented	1	2
Implementability			
	Technical Feasibility		
	Construction & operational considerations	3	2
	Demonstrated performance/useful life	1	3
	Adaptable to environmental conditions	3	3
	Contributes to remedial performance	1	3
	Can be implemented within one year	1	3
	Can be implemented within six weeks	1	2
	Availability		
	Equipment	3	2
	Personnel & services	3	2
	Outside laboratory testing capacity	2	2
	Off-site treatment and disposal capacity	1	3
	Post removal site control	1	2
	Administrative Feasibility		
	Permits required	3	2
	Elimination of existing public safety & building code violations	NA	NA
	Easements or right-of-way requirements	NA	NA
	Impact on adjoining properties	1	2
	Ability to impose institutional controls	NA	NA
	Likelihood imposed obtaining exemption from statutory limits, if needed	NA	NA
	Total	**35**	**47**

1=Poor; 2=Average; 3=Good
NA – Not applicable
(1) Includes UST removal

TABLE E-2
ARARs for the Recommended Alternative (Soil Excavation/Disposal)

ARARS	STATUS	MAJOR REQUIREMENTS	RECOMMENDED ALTERNATIVE ACTION
Massachusetts Contingency Plan (MCP) 310 CMR 40.0000	**Applicable**	Establishes methodology for evaluation and remediation of oil/hazardous materials, and cleanup standards for risk characterization.	Will require submittal of Release Abatement measure Plan to MassDEP and proper disposal and waste tracking of contaminated soil removed from the site.
USEPA Disposal of PCBs 40 CFR Parts 750 and 761	**Not Applicable**	Establishes methods and standards for the removal and disposal of PCB-impacted media and decontamination for PCB contaminated materials	PCBs are not a contaminant of concern at the site
OSHA 29 CFR Parts 1926	**Applicable**	Regulates worker protection standards and exposures.	The recommended alternative will require the Contractor to prepare a Health & Safety Plan in accordance with OSHA standards and to implement safe construction practices.
Massachusetts Wetlands Protection Act/Rivers Protection Act; 310 CMR 10.0000	**Not Applicable**	Regulates activities occurring within 200 feet of a river.	The site is not located near any wetland resource areas and is well beyond the 200 foot buffer zone along the Connecticut River.
Clean Air Act – Federal	**Not Applicable**	Establishes program control and prevents airborne particulates and toxic emissions and control volatile and other hazardous emissions.	Contractor will be required by project contract documents to implement specific emission controls including dust suppression and wetting.
Resource Conservation and Recovery Act and regulations	**Not Applicable**	Defines federal dangerous waste requirements for those who generate, store, treat or dispose of it. Key elements included requirements for and permitting of disposal facilities and land disposal facilities.	Some RCRA requirements could be relevant and appropriate, including siting and operational requirements for dangerous waste disposal facilities. These requirements will be met by disposing of site soils at appropriately permitted facilities, in accordance with the MCP.