FINAL REMEDIAL INVESTIGATION/ALTERNATIVES ANALYSIS (RI/AA) REPORT

NIAGARA MOTORS SITE
(NYSDEC SITE NO. E907025)
760 LAMPHERE STREET
CITY OF DUNKIRK
CHAUTAUQUA COUNTY, NEW YORK

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1.0 INTRODUCTION

1.1 Purpose

The City of Dunkirk (the City) entered into a State Assistance Contract with the New York State Department of Environmental Conservation (NYSDEC) to complete a Remedial Investigation/Alternatives Analysis (RI/AA) program at the Niagara Motors site (project site) located at 760 Lamphere Street in the City of Dunkirk, New York as seen on Figure 1. The RI was completed pursuant to the Environmental Restoration, or Brownfield, Program, component of Title 5 of the Clean Water/Clean Air Bond Act of 1996, which is administered by the NYSDEC. The purpose of the RI/AA program described herein was to characterize the nature and extent of contamination occurring on, and/or emanating from the project site, and to develop and evaluate remedial alternatives, as appropriate.

TVGA Consultants (TVGA) has prepared this report on behalf of the City to provide a detailed description of the RI/AA program implemented at the Niagara Motors site. In addition to summarizing and documenting the methods used to investigate the project site, this RI/AA Report describes the physical characteristics of the site; defines the nature, magnitude and extent of contamination encountered; assesses the contamination with respect to fate, transport and exposure; and identifies appropriate remedial action objectives (RAOs). Also discussed in this report are the screening and detailed analysis of remedial alternatives, and the identification of the most suitable remedy available to satisfy the RAOs.

1.2 Site Background

1.2.1 Site Description

The former Niagara Motors Site consists of 2.02 acres of land located to the northwest of the intersection of New York State (NYS) Route 60 and Ice Cream Drive in Dunkirk, New York. Figure 1 shows the location of the project site and Figure 2 shows the configuration and tax parcel (SBL 57-7-6) information. The project site address is referenced as 760 Lamphere Street, which is also identified as NYS Route 60. Figure 4 is included as a Field Investigation map and shows the property boundaries and former building locations. There is a “U” shaped gravel driveway that provides access to the project site off of NYS Route 60. Portions of concrete foundations are evident near the ground surfaces. No aboveground structures, other than power poles, are currently present on the project site. Several areas of discolored surface soils and areas with limited vegetation were observed on the project site. A series of railroad tracks adjoin the subject property on the north and west sides. Ice Cream Drive and NYS Route 60 adjoin the subject property on the south and east sides, respectively.

1.2.2 Site History

The project site has been used for various industrial purposes from at least 1919 through the 1970’s. Operations ceased in the 1970’s and the on-site industrial building was abandoned approximately 10 years later. As a result, the building fell into disrepair and was demolished in the year 2000. The site has been vacant since that time. The City of Dunkirk and Chautauqua County have identified the project site as a prime candidate for restoration and redevelopment. The project site's positive attributes include its size; the presence of existing infrastructure (e.g. municipal sanitary, water, natural gas); position within an empire zone; and proximity to an existing interchange on Interstate I-90.

The City of Dunkirk is considering the acquisition of the Niagara Motors parcel via tax foreclosure. The actions of the City of Dunkirk and Chautauqua County with respect to the acquisition of the project site have been coordinated with the intent of having the project site under the control of the City of Dunkirk after foreclosure. The City obtained temporary incidents of ownership of the project site for the sole purpose of entering the project site and conducting an environmental investigation.

1.2.3 Previous Environmental Investigations

On August 4, 1999, the New York State Department of Environmental Conservation (NYSDEC) and Chautauqua County Health Department representatives observed approximately thirty drums of apparent petroleum product on the project site during a routine inspection at the adjacent Fieldbrook Farms. In addition, apparent oil spillage was observed on the ground and on the floor surface within the on-site building. As a result, the project site was listed on the NY SPILLS database and assigned Spill Number 9975340. Following several unsuccessful attempts to have the owner remove the drums and remediate soil impacts, NYSDEC completed a sampling/analysis program that focused on the suspect oil contamination present on the floor inside of the building. The results from this sampling/analysis program identified the suspect oil on the floor as lubricating oil.

The NYSDEC visited the project site again on September 6, 2000, at which time the building was demolished but the contaminated soil remained. The issue was subsequently referred to NYSDEC's legal department and then to the NYS Attorney General's office. NYSDEC completed a site visit during the spring of 2003, at which time no oil stains were observed on the surface soils, no sheens were observed on puddles of water, and no stressed vegetation was observed. As a result, the NYSDEC changed the status of the spill from active to closed on May 14, 2003. It is not clear from the current information when the drums were removed, if any surface soils were removed.

1.2.4 Areas of Potential Environmental Concern

To identify the potential environmental concerns relative to the project site, TVGA reviewed historical and environmental information regarding the site and surrounding properties. The review included:

- Fire insurance maps
- Aerial photographs

- Historical newspaper articles
- Street directories
- Environmental databases

In addition, TVGA conducted interviews with people with knowledge of the site's historical operations and completed a site reconnaissance. The results of the review, interviews, and reconnaissance are detailed in the February 2005 Work Plan. Based on this work, the following areas of potential environmental concern were identified for the project site:

- The previously documented presence of petroleum-impacted surface soil and floor surfaces on the project site.
- The presence of discolored surface soil and stressed vegetation on the project site.
- The potential for surface and subsurface contamination in connection with the former use of the site for industrial/manufacturing purposes for over 80 years. Contaminants of concern included:
    - Polychlorinated biphenyls (PCBs) stemming from the probable operation and maintenance of former PCB-containing electrical equipment.
    - Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals related to the former industrial/manufacturing operations completed at the project site.
- The potential for contamination resulting from leaks and/or spills of petroleum products from unsecured drums previously present on the project site.
- The potential presence of a documented 14,000-gallon UST and the potential for other undocumented USTs.
- The potential for contaminant migration from adjacent properties including an electrical substation formerly situated to the south and the rail facilities to the north of the project site.

2.0 METHODS OF INVESTIGATION

The scope of the Remedial Investigation program was generally consistent with that outlined in the NYSDEC-approved February 2005 Remedial Investigation/Alternatives Analysis Work Plan (Work Plan) and Extra Work Authorizations 1 through 3 submitted on September 22, 2005, June 5 and October 6, 2006, respectively. The purpose of the Remedial Investigation program was to determine the nature and extent of contamination associated with the areas of environmental concern discussed in Section 1.2.4. To accomplish these goals, the following tasks were completed during the field investigation:

- Completion of a boundary survey of the project site. The surveying work also included developing a base map and locating the horizontal and vertical positions (where appropriate) of sample locations and relevant site features. This survey is included as Figure 3 and was performed by Michael Rodgers.

- Collection and analysis of two off-site background surface soil samples to create a database of background concentrations with which the on-site analytical testing results could be compared. Results for two off-site background samples collected during the investigation of the nearby Roblin Steel site in Dunkirk were also incorporated into this database.
- Collection and analysis of on-site surface soil/fill samples to classify and characterize the surface soil/fill.
- Completion of a geophysical survey to identify magnetic anomalies that might indicate the presence of buried drums or tanks.
- Completion of test pits to identify the cause of magnetic anomalies and to enable the classification, screening, sampling and chemical characterization of the subsurface soil.
- Completion of test borings to characterize subsurface soil conditions and facilitate the installation of groundwater monitoring wells.
- Installation, development and sampling of monitoring wells to determine the groundwater flow direction and gradient, and to collect and analyze groundwater samples.
- Evaluation of the resulting data and preparation of a report to:
    - Summarize and document the activities performed during the RI
    - Describe the physical characteristics of the project site
    - Describe the nature, magnitude and extent of contamination
    - Compare the analytical data to applicable regulatory levels
    - Assess the implications of the encountered conditions
    - Provide recommendations relative to future work requirements and remedial action objectives

The following section describes the field tasks in detail.

2.1 Field Investigation

The following subsections describe the scope of field activities associated with the remedial investigation program. This scope reflects minor deviations and/or additions from the initial scope, as some minor modifications were necessary to account for information obtained during the field investigation or were performed at the request of the NYSDEC. Any deviations were approved by the NYSDEC prior to implementation. The methods employed during the execution of the field tasks were detailed in the Field Sampling Plan (FSP), while the procedures ensure the quality of the resulting field and laboratory data were completed in accordance with the Quality Assurance/Quality Control (QA/QC) Plan. Table 1 summarizes the number of samples collected during the investigative tasks, including QA/QC samples, and the corresponding analytical methods. Figure 4 shows the field investigation locations.

2.1.1 Site Survey

TVGA performed a survey to establish the boundaries of the project site. The surveying work also included developing a base map and locating the horizontal and vertical positions (where appropriate) of sample locations and relevant site features. This survey is included as Figure 3. Elevations of the monitoring wells were reported relative to an assumed site datum of 100 feet, established from a benchmark that consisted of a nail driven into the “U” shaped gravel driveway.

2.1.2 Background Soil Samples

Two background surface soil samples were collected in October 2005 from off-site locations to define local baseline conditions. The samples were collected in accordance with Section 10.2 of the FSP. The locations of these samples include the “Dunkirk School 3” [BG1(0.5)] and “Murray Hose #4” [BG2(0.5)] lawns located to the north and east, respectively, of the project site. The samples were collected from zero to two inches below the vegetative layer. To supplement this background data, two background samples collected during the investigation of the former Roblin Steel site, which is less than one mile from the project site, have also been included in this report. As described in the report for the former Roblin Steel site, these samples were collected from two residential properties on South Roberts and Middle Road. The background samples were analyzed for Target Compound List (TCL) SVOCs and PCBs and Resource Conservation and Recovery Act (RCRA) metals.

2.1.3 Geophysical Survey

A time-domain terrain conductivity geophysical survey was performed on September 23, 2005 across the project site to determine if USTs and/or other metallic anomalies existed in the subsurface. A subcontractor to TVGA Consultants, Geomatrix Consultants, Inc. (Geomatrix) employed a GEONICS EM61 High Sensitivity Metal Detector (EM61) and solid-state data logger during the geophysical survey. The survey was conducted utilizing a spacing of three feet over all accessible areas of the project site to locate major anomalies. The Geomatrix letter report, presented in Appendix A, includes a map that illustrates the location of identified anomalies.

2.1.4 Test Pit Excavations

Fifteen test pits were excavated in October 2005 in accordance with Section 6.0 of the FSP. The purpose of the test pits was to characterize the source of magnetic anomalies; characterize the near-surface geology across the project site; and identify and delineate areas of subsurface contamination via the field screening and chemical analysis of soil/fill samples. A total of five soil/fill samples were collected in October 2005 from the test pits for chemical analysis. An additional 11 test pits were completed in 2007 to further delineate the vertical extent of RCRA metal and SVOC contamination. From the 11 test pits completed in 2007, an additional nine soil/fill samples were submitted for TCL SVOC and RCRA metals analysis. These do not include the samples collected from the upper six inches of TP-6, TP-13, TP-14, TP-15 and TP-16, which were considered surface soil samples and are therefore discussed in Section 2.1.5 below. The test pit locations are shown on Figure 4.

The City Department of Public Works provided a backhoe and operator for digging the test pits, while TVGA personnel provided field oversight. The excavation occurred in one- to two-foot increments until a subsurface feature was encountered, native soils were encountered, or a depth of ten feet was reached. Excavated material was staged directly adjacent to the test pit. Visual characterization was performed for all test pits and the soil was screened for total organic vapors (TOVs) using a photoionization detector (PID). Following characterization and sample collection, the excavated soil/fill was returned to the test pit from which it originated. Logs that detail the observations made during the test pit activities are included in Appendix B.

2.1.5 Surface Soil Sampling

Five surface soil samples SS-1 through SS-5 were collected in October 2005 to evaluate the degree of contamination in the surface soil/fill, if any. The surface soil/fill sampling locations are shown on Figure 4. The surface soil samples were collected from zero to six inches below the vegetative layer. These grab samples were collected from areas of concern which included:

- The geophysical anomalies at the TP-C, TP-E and TP-I locations
- The northeast corner of the former Niagara Motors structure
- Within the footprint of the former Niagara Motors structure

These samples were analyzed for TCL SVOCs and PCBs and RCRA metals.

Based on the SVOC and RCRA metal results of the October 2005 investigation, additional surface soil samples were collected in October 2007. These samples included SS-6 through SS-19 and SS-21 through SS-29 collected at approximately 0.5 feet below the ground surface and TP-6, TP-13, TP-14, TP-15 and TP-16 collected from depths ranging from 0.1 to 0.5 feet below ground surface. These samples were collected to further characterize and delineate the extent of RCRA metal and/or SVOC contamination throughout the site and to evaluate offsite impacts, if any, from the project site. The sample locations are shown in Figure 4.

2.1.6 Test Borings and Monitoring Well Installation

A total of ten test borings were advanced on the project site on December 28 and 29, 2005 to characterize the subsurface soil and facilitate the installation of groundwater monitoring wells. Groundwater monitoring wells were installed in four of the test borings to determine the groundwater flow direction of the upper-most water-bearing zone, as well as characterize the groundwater quality at the project site. The test boring/ monitoring well locations and groundwater contours are shown on Figure 5.

The drilling, split-spoon sampling, and monitoring well installation procedures were completed in accordance with Section 7.0 of the FSP. A truck-mounted rotary drilling rig equipped with hollow-stem augers was used to advance the test borings into the overburden materials. Four of the borings were completed as monitoring wells. Each well was screened in the uppermost water-bearing zone.

Retrieved soil samples from each test boring were screened for TOVs using a PID. The TOV values and soil descriptions are recorded on Test Boring Logs. These logs and the respective Monitoring Well Completion Reports are included in Appendix B.

2.1.7 Monitoring Well Development and Sampling

The groundwater monitoring wells were developed on January 10, 2006 and sampled on January 11, 2006 in accordance with the procedures detailed in the FSP. Prior to commencement of development activities at each well, the groundwater level was measured using a decontaminated electronic water level indicator. Well development included evacuation of groundwater from each of the wells with a peristaltic pump with dedicated silicone pump tubing and polyethylene down-hole tubing. The development criteria included well purging until the indicator parameters (pH, temperature, and conductivity) had stabilized or the well went dry (MW-2 and MW-4). After the completion of development, the monitoring wells were allowed to recharge. The samples were collected within 24 hours of completing the well development.

The water level data, along with survey data, was used to calculate groundwater elevations and determine the hydraulic gradient and groundwater flow direction at the project site. At each well, TCL VOC samples were collected with a disposable polyethylene bailer/rope, while TCL SVOCs and PCBs and RCRA metals were collected utilizing the peristaltic pump and dedicated tubing from the well development. The Monitoring Well Development/Sampling Logs are included in Appendix B.

2.1.8 Interim Remedial Measures

Two USTs were encountered during the October 2005 test pit investigation while determining the sources of the identified magnetic anomalies. A 9,000-gallon UST was located at the test pit TP-D location. The other UST, a 300-gallon tank, was located in the vicinity of test pit TP-M. Both of the USTs and their and contents were removed from the project site as an Interim Remedial Measure (IRM) conducted in October 2006. Additionally, impacted soils from the vicinity of the former 9,000-gallon UST were removed and properly disposed. The former locations of the two USTs are shown on Figure 4. An IRM Report which describes the IRM activities is included in Appendix D.

2.2 <u>Sample Analysis/Validation</u>

2.2.1 Laboratory Analysis

All chemical analyses were performed by the Columbia Analytical Services (Columbia), which is accredited under the New York State Environmental Laboratory Approval Program (ELAP) Contract Laboratory Program (CLP). The samples were analyzed using the applicable methods prescribed by the NYSDEC Analytical Services Protocol (ASP), June 2000. Category B deliverables were generated for the samples.

2.2.2 Quality Assurance/Quality Control Samples

In addition to field samples, Quality Assurance/Quality Control Samples were collected to evaluate the effectiveness of the QA/QC procedures implemented during the field and laboratory activities associated with the project. These QA/QC samples were collected and analyzed in accordance with the February 2005 QA/QC Plan developed for the project site. As reflected by Table 1, QA/QC samples included matrix spike (MS), matrix spike duplicate (MSD) and matrix duplicate (MD) samples, trip blanks, and blind field duplicate samples.

2.2.3 Data Validation

A subcontractor to TVGA, Data Validation Services (DVS), performed the validation of the laboratory data in accordance with the *NYSDEC Guidance for the Development of Data Usability Summary Reports* (DUSRs). The data packages were first reviewed for completeness and compliance relative to the criteria specified in the aforementioned NYSDEC document. DVS then conducted a detailed comparison of the reported data with the raw data submitted as part of the supporting documentation package, and applied protocol-defined procedures for the identification and quantitation of the individual analytes to determine the validity of the data. The DUSRs include a narrative summary discussing all quality issues and their impact on the reported results and presents copies of laboratory case narratives. The DUSR is included in Appendix C.

3.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

3.1 Physical Setting

The project site is located in the Erie-Ontario Lowlands physiographic province. This province is characterized by a series of low relief plains separated by higher relief escarpments. Sheets of glacial till and lacustrine deposits consisting primarily of silt and clay cover the plains.

The topography of the project site is generally flat with a gentle slope downward to the north. The southwestern portion of the project site is lower and periodically retains surface water based on observations of standing water and the type of vegetation present. The site has an elevation of approximately 645 feet above mean sea level (AMSL) based upon the USGS topographic mapping of the area.

3.2 Geology

A review of the Soil Survey of Chautauqua County, New York revealed that the predominant soil unit occurring on the project site is the Niagara silt loam on zero to three percent slopes. The Niagara silt loam soils consist of very deep, somewhat poorly drained, nearly level soils on lake plains and to a lesser extent on broad flats in the larger valleys.

Based upon a review of the Surficial Geologic Map of New York – Niagara Sheet (1988), the on-site overburden consists of lacustrine silt and clay deposits. These deposits are characterized as generally laminated silts and clays that were deposited in proglacial lakes.

Upper Devonian sedimentary strata deposited over 300 million years ago dominate the bedrock geology of the region. Generally, these Devonian age sedimentary rocks are homoclinal with a regional dip to the southwest of approximately 40 feet per mile and exhibit only subtle post-depositional structural features. According to the Geologic Map of New York – Niagara Sheet (1970), the project site is underlain by bedrock consisting of Gowanda, South Wales and Dunkirk Shales belonging to the Canadaway Group.

The results of the remedial investigation indicate that soil/fill overlies the native soil across the entire site. A thin veneer of soil/fill material with a thickness of one foot or less was typically present as the uppermost overburden layer throughout the project site. This material primarily consists of clayey-silt and fine sand that contains a significant quantity of metal shavings and internal combustion engine parts and pieces. Underlying the "soil/fill" material was a gray and brown clayey-silt with varying quantities of sand and gravel to an average depth of four feet below grade. This material appears to be reworked native soils. It should be noted that gray, weathered shale was dispersed within these reworked soils. The underlying native soils are similar to the reworked soils. The in-situ weathered shale was encountered at approximately twelve feet below grade across the site.

3.3 Hydrology/Hydrogeology

3.3.1 Stormwater

Generally, storm water runoff drains in the north and southwest directions across the surface of the project site towards the following two areas:

- A drainage ditch along the northwestern boundary of the project site.
- A low-lying area on the southwest portion of the site.

Standing water was observed in the southwestern portion of the project site during early April 2004 and during the October 2005 field work. This low-lying area on the project site contains vegetation that is typical of that found in low, periodically wet zones. Although the vegetation was unchanged during the October 2007 investigations, no standing water was observed at ground level. The drainage ditch in the northern portion of the project site parallels the New York Central Railroad property that generally bounds the site on the north and reaches a culvert that passes under NYS Route 60. A review of wetland maps for the vicinity of the project site indicated that no state or federal wetlands are located on the project site.

3.3.2 Surface Water Bodies

The surface water drainage in Chautauqua County is separated into two systems: the Lake Erie-St. Lawrence system and the Allegheny-Ohio-Mississippi River system. The project site is located within the Lake Erie-St. Lawrence system and is situated approximately one mile south of Dunkirk Harbor and Lake Erie, near Point Gratiot. The nearest surface water body identified on the available USGS topographic mapping is Crooked Brook, which is located approximately 3,000 feet southwest of the project site.

3.3.3 Groundwater

Regional groundwater flow, as inferred by the available topographic mapping of the project site and vicinity, is to the north toward Lake Erie. Data available from the *Former Roblin Steel Site SI/RAR* (TVGA Consultants 2003) have demonstrated a general northerly groundwater flow with a significant component of groundwater flow within fractures in the underlying bedrock.

The project site and surrounding residences and businesses within the City of Dunkirk are serviced by the municipal water supply system that relies upon water withdrawn from Lake Erie.

Hydrogeologic conditions across the project site were investigated through the installation of four groundwater monitoring wells (MW-1 through MW-4). The Monitoring Well Construction Reports are included in Appendix B. All four wells are screened in the upper-most water-bearing zone in the overburden soil.

Generally, groundwater was present in the native material. Static water levels in the wells were measured on January 11, 2006. Table 2 summarizes the groundwater elevation measurements and the resulting groundwater contours are shown on Figure 5. The depths to groundwater generally ranged from approximately three to six feet below the existing ground surface and the groundwater flow direction is generally to the north.

4.0 NATURE AND EXTENT OF CONTAMINATION

Surface soil/fill, subsurface soil/fill, and groundwater samples were collected for chemical analyses to determine the magnitude and extent of potential contamination occurring in these media. A summary of the samples collected from these media, including the number and type of QA/QC samples and the corresponding analytical methods are presented in Table 1.

The following sections summarize and discuss the analytical results generated during the RI. For discussion purposes, this data is compared with the Standards Criteria and Guidance values (SCGs) applicable to each medium sampled, and include:

- Soil/Fill: NYSDEC's December 2006 6NYCRR Part 375 Commercial Use and Unrestricted Use Soil Cleanup Objectives (Part 375 - Subpart 6.8).
- Groundwater: NYSDEC's June 1998 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations in the Technical and Operational Guidance Series (TOGS) 1.1.1
- Soil/Fill analyzed by TCLP: 40 CFR Part 261.24: Maximum Contaminant Levels for Toxicity Characteristic.

A series of summary tables (Tables 3 through 8) comparing the data to the applicable SCGs has been integrated into the following discussions. Table 9 includes the list of qualifiers used in Tables 3 through 8. The analytical laboratory reports are included in Attachment A.

As described in Section 2.2.3, the laboratory analytical packages prepared by Columbia were reviewed and evaluated by DVS to assess compliance with the analytical method protocols described in the NYSDEC Analytical Services Protocol (ASP). A DUSR was prepared that compares the quality of the performance of the laboratory analyses to that described in the ASP. The DUSR is included in Appendix C. All analytical results summary tables discussed in this report include only the validated data.

The evaluation of the analytical results for samples collected from the project site indicate that the samples were processed in general compliance with applicable protocols, and most results are usable as reported, or usable with minor edits or qualification as estimated or edits to non-detection. Generally the samples showed good accuracy and precision.

4.1 Background Soil

Four background soil samples were used as part of this investigation. The background samples were analyzed for TCL SVOCs, PCBs and RCRA metals to characterize background levels in the vicinity of the project site and facilitate the evaluation of the analytical results generated from on-site sampling. Table 3 summarizes the background soil sampling analytical results.

A comparison of the results from these four samples indicates that they are generally similar. One or more SVOCs, primarily polycyclic aromatic hydrocarbons (PAHs), were detected in each of the background samples. Because PAHs are formed through anthropogenic combustion processes such as the burning of coal, oil and gasoline, they are generally ubiquitous in soils in urban settings. One of the background samples exceeded the commercial use SCG for one SVOC. Additionally, several SVOCs, arsenic and lead exceeded unrestricted use SCGs. PCBs were not detected in the background samples. The site background concentration for each of the metals was generally within or below the published background concentration ranges for each analyte.

4.2 Surface Soil/Fill

The surface soil/fill observed during the field investigations generally consisted of soil material with varying amounts of metal shavings. Five surface soil/fill samples were collected in October 2005 from the project site and analyzed for TCL SVOCs, PCBs and RCRA metals. No PCBs were detected in these samples and therefore these analytes will not be discussed below. Additional surface soil/fill samples were collected in October 2007 and included nineteen samples (twelve onsite and seven off-site) that were analyzed for RCRA metals and ten samples (six onsite and four off-site) that were analyzed for TCL SVOCs. This section discusses the analytical results for samples collected on-site and Section 4.3.4 discusses the off-site samples. Table 1 presents a summary of the surface soil samples, including the number samples, the type of QA/QC samples and the corresponding analytical method. Tables 5 and 6 summarize the SVOC, and metals analytical results, respectively. Figure 6 depicts both on-site and off-site surface soil locations and surface areas that exceed commercial use cleanup objectives.

4.2.1 Semi-Volatile Organic Compounds

One or more SVOCs, primarily PAHs, were detected in each of the eleven surface soil/fill samples collected from the project site. Contraventions of the commercial use SCGs occurred in six of the eleven samples; however, only one sample (SS-5) contained concentrations significantly above the commercial use SCGs. The total SVOC concentrations detected at this location were 1,598,000 ug/Kg. The concentrations of total SVOCs in the other five samples exceeding the commercial use SCGs ranged from 95,040 ug/Kg to 164,860 ug/Kg. Of the five samples with SVOC concentrations below the commercial use SCGs, only one sample (SS-2) contained concentrations that were above the unrestricted use SCGs.

The elevated SVOC concentrations are likely attributable to historic operations at the project site, including more than 50 years of motor manufacturing with associated machine shop-related activities. Poor housekeeping efforts, including unsecured drums and spilled oil on the ground surface and interior floors, were identified in 1999 by the NYSDEC.

4.2.2 Metals

Five of the eight RCRA metals were detected at concentrations that exceed the commercial use SCGs in at least one surface soil/fill sample and seven of the eight RCRA metals were detected at concentrations above the unrestricted SCG in at least one sample. The results indicate that the primary contaminants of concern are arsenic and lead. A comparison of the results for samples collected at the surface and those collected at depth at locations TP-6, TP-13, and TP-14, the significantly elevated metals concentrations are present at or very near the ground surface while the concentrations significantly decrease just one to two feet below grade.

The elevated concentrations are likely the result of the presence of metal shavings and pieces in the surface soil/fill as well as impacts from historical operations. Field observations corroborated the analytical results because the overlying fill with elevated concentrations was visually distinct from the underlying reworked native material, which did not exhibit the elevated metals concentrations. In the case of TP-13, backfill along a pipe at two feet below grade was found to contain elevated metals concentrations but the underlying material did not contain elevated concentrations.

Although the sample collected from SS-12 exceeded the commercial use guideline for arsenic, this concentration appears to be more indicative of background concentrations when compared to the background sampling results.

4.3 Subsurface Soil

The subsurface soil was characterized during the excavation of test pits and drilling of test borings. A total of 15 test pits and 10 test borings were completed during October 2005. Five subsurface soil samples were collected from the test pits in 2005 to characterize the subsurface soil/fill material. The subsurface samples collected during this event were analyzed for TCL VOCs, SVOCs, and PCBs and RCRA metals. No PCBs were detected in the samples.

An additional eleven test pits were completed in October 2007. From these test pits, nine subsurface soil samples were analyzed for RCRA metals and nine other samples were analyzed for TCL SVOCs.

The analytical results for the VOC, SVOCs, and metals results are summarized in Tables 4, 5 and 6, respectively. Figure 7 depicts subsurface characterization locations, contaminants of concern, and the estimated extent of subsurface contamination.

4.3.1 Volatile Organic Compounds

As shown on Table 4, at least one VOC was detected in each of the five subsurface soil samples. These compounds were detected at very low concentrations, well below the SCOs for unrestricted and commercial use.

4.3.2 Semi-Volatile Organic Compounds

Because the most elevated concentrations of SVOCs were detected in surface soil sample SS-5, test pits TP-7 through TP-12 were completed in and around that sampling location to evaluate the vertical extent of contamination. As the field observations and analytical results demonstrate, the SVOC contamination at this location was restricted to the approximately six inches of soil lying on top of the building slab.

Test pits TP-15 and TP-16 were completed just off the building slab to evaluate the potential presence of contaminants related to previous reports of drum storage behind the former building. Field observations of soil/fill in TP-15 indicate that impacts may extend to approximately four feet below grade. The underlying native material at four feet below grade did not contain evidence of impacts. The estimated area of impacted soil is identified as Area B on Figure 8. The analytical results for TP-16 show that SVOC contamination is restricted to the surface soil, and that the underlying soil below one foot below grade does not contain any SVOCs above the unrestricted or commercial use SCGs.

Nuisance characteristics including stained soils and petroleum odors along with high TOV readings were identified in a number of subsurface soil investigation locations in the vicinity of the former 300-gallon UST. The UST was encountered in test pit TP-M, which demonstrated nuisance characteristics, as did other proximal test pits including TP-F, TP-G, TP-H, TP-I, and TP-J.

A soil sample was collected from test pit TP-F at the interval with the highest PID measurements, 8 feet below grade. This sample contained only two SVOCs, which were present at very low concentrations, and tentatively identified compounds (TICs) at significantly higher concentrations. The presence of TICs along with the nuisance characteristics indicates that significant degradation of any petroleum in the area has occurred. This area of sampling locations with nuisance characteristics is identified as Area A on Figure 8.

As described in Section 2.1.8 and Appendix D, the petroleum impacted soil in the vicinity of the 9,000-gallon UST was removed and properly disposed at the Chautauqua County Landfill during the implementation of the IRMs.

4.3.3 Metals

As discussed in Section 4.2.3, backfill along a pipe at two feet below grade was found to contain elevated metals concentrations, as shown by the results for TP-13 collected from 2 – 2.2 feet below grade. The underlying material at 4.5 feet below grade did not contain elevated concentrations. This area is labeled as Area C on Figure 8. Because this lead concentration was the highest detected on the site, the toxicity characteristic leaching procedure (TCLP) was performed on the sample collected from 2 – 2.2 feet below grade at TP-13 and was analyzed for lead to determine if this area contains characteristic hazardous waste. The TCLP lead concentration was 56.1 ppm, over the applicable SCG of 5 ppm.

4.4 <u>Off-Site Surface Soil</u>

Off-site surface soil samples were collected from the right-of-way along both Ice Cream Drive and Lamphere Street to evaluate impacts, if any, from the project site. Seven soil samples were collected and analyzed for RCRA metals and four soil samples were collected and analyzed for TCL SVOCs. The analytical results are summarized in Table 7.

Although a number of SVOCs were detected in each of the four off-site samples, none exceeded the SCGs. Arsenic, chromium and lead were detected at concentrations exceeding the unrestricted use SCGs in five of the seven off-site locations; however, these concentrations are characteristic of urban roadside conditions or background concentrations as is demonstrated by comparison to the background soil samples collected for this project and, therefore, do not demonstrate impacts from the project site. None of the metals concentrations exceeded the commercial use SCGs.

4.5 Groundwater

Groundwater samples were collected from the four monitoring wells and analyzed for TCL VOCs, SVOCs and PCBs, and RCRA metals. Figure 5 shows the well locations and Table 8 summarizes the analytical results. Although one VOC, VOC TICs and five metals were detected in the groundwater samples, all the detected concentrations were below the applicable SCGs. No SVOCs or PCBs were detected in the groundwater samples.

5.0 CONTAMINATION ASSESSMENT

5.1 Contaminant Fate and Transport

The probable fate and transport of contaminants detected on the project site is a function of the properties of the individual contaminants and available pathways for the contaminants to migrate. The project site is currently an unutilized industrial property; however, it is planned that future use of the project site will include commercial or light industrial development. The degree to which, as well as the route by which, contaminants migrate is dependent on the physical characteristics of the site and the type and distribution of contaminants. The following sections discuss the probable fate and transport of contaminants in the surface and subsurface soil at the Niagara Motors site. Because groundwater is not an affected resource, the following discussion does not include groundwater.

5.1.1 Surface Soil/Fill

Contaminants of concern detected in the surface soil/fill consist of SVOCs, arsenic, barium, cadmium, chromium and lead. The SVOCs detected were primarily PAHs, many of which are known carcinogens. These compounds are characterized by low solubilities and high octanol-water partition coefficients, and, therefore, have a tendency to adsorb onto soil particles. In addition, the PAHs have relatively low vapor pressures and are expected to remain in a solid or liquid state and undergo degradation via naturally occurring microbes. The metals also have low solubilities and therefore are not expected to significantly affect groundwater quality or migrate substantially in to the subsurface. This is supported by the absence or low detections of these analytes in the groundwater samples. Because these materials are exposed at the ground surface at low concentrations, off-site migration is not likely to occur.

5.1.2 Subsurface Soil

The investigation results indicate that contaminants of concern in the subsurface soil include SVOCs and metals, as well as petroleum nuisance characteristics. The fate and transport of the SVOCs and metals is similar to those in the surface soils discussed in Section 5.1.1, with the exception of windborne transport. The subsurface deposition of the contaminants eliminates the potential for windborne transport and surface water runoff. It is expected that the petroleum associated with the nuisance characteristics will continue to naturally degrade.

5.2 Evaluation of Potential Receptors

The project site is located in an area that is characterized by residential properties to the east, a railroad to the west and south, a food manufacturer to the southwest and a public school to the north. Access to the project site is unrestricted.

Under current conditions, potential human receptors include persons:

- Working or trespassing on the project site
- Living and working in the area surrounding the project site
- Working in or attending the nearby public elementary school

Potential environmental receptors include wildlife living on and migrating through the project site.

The surrounding area is serviced by a municipal water supply system that relies upon water withdrawn from Lake Erie. Considering the absence of contaminants of concern in the groundwater and the lack of reliance on groundwater as a potable water supply source in the immediate vicinity and downgradient of the project site, the exposure to on-site contamination via groundwater is not a concern.

The planned future use of the project site is for commercial or light industrial development. Because SVOCs and metals were detected at concentrations above the SCGs, remediation will be required prior to redevelopment. During remediation and redevelopment, potential human receptors include site workers as well as persons living in and traveling through the area surrounding the project site. Potential environmental receptors include wildlife living on and migrating through the project site.

No human and/or environmental receptors have been identified in connection with the post-remediation, assuming that the contaminated media has been properly covered or removed.

5.3 Potential Exposure Pathways

5.3.1 Surface Soil/Fill

Under the current use scenario, persons living and working in the vicinity of the project site and/or persons trespassing on the site could be exposed to SVOCs and metals in the surface soil/fill via inhalation of airborne particles, incidental ingestion of, or dermal contact with the contaminated media.

Construction workers, site visitors and persons living, working and traveling through the area near the project site could be exposed to contaminants in the surface soil/fill during excavation or handling of the material during remediation and/or site redevelopment activities. Potential exposure routes for these receptors include inhalation of contaminated dust, and incidental ingestion of, and/or dermal contact with the contaminated soil/fill. However, the use of appropriate personal protective equipment, dust suppression techniques, and the development and implementation of a soil/fill management plan would likely minimize the risk of exposure during remediation and/or construction activities.

No complete exposure pathways to the contaminated surface soil/fill have been identified in connection with the post-redevelopment period, assuming that the contaminated surface soil/fill has been properly covered or removed.

5.3.2 Subsurface Soil/Fill

The presence of contaminants in the subsurface soil/fill is not interpreted to represent a current human or environmental exposure risk because no complete exposure pathways were identified under the current use scenario for the project site. Environmental receptors, construction workers, site visitors and persons living, working and traveling through the project site could be exposed to the contaminants in the subsurface soil during excavation of the contaminated soil/fill in connection with the remedial and/or site redevelopment activities. Potential exposure routes for these receptors include inhalation of contaminated dust and organic vapors and incidental ingestion of and/or dermal contact with the contaminated soil/fill. However, the use of appropriate personal protective equipment, dust suppression techniques, and the development of a Soil/Fill Management Plan would minimize the risk of exposure during the remedial and/or site redevelopment construction activities.

No complete exposure pathways have been identified in connection with the post-redevelopment period, assuming that the contaminated subsurface soil/fill has been removed, properly treated or covered.

6.0 IDENTIFICATION AND DEVELOPMENT OF ALTERNATIVES

6.1 Remedial Action Objectives

The following sections outline the Remedial Action Objectives (RAOs) identified for each of the contaminated media encountered on the project site. These RAOs are based upon the findings of the RI and the anticipated future use of the project site for commercial or light industrial development.

6.1.1 Surface Soil/Fill

Contaminants of concern detected in the surface soil/fill consist of SVOCs and metals. The RAO for this medium is to prevent exposure of human and environmental receptors to these contaminants via dermal contact or incidental ingestion of particulates or the inhalation of particulates, windborne transport of the material, and the discharge of contaminated storm water runoff to off-site locations.

6.1.2 Subsurface soil

Contaminants of concern detected in the subsurface soil include SVOCs, metals and petroleum nuisance characteristics. The RAO for this medium is to prevent the exposure of humans and environmental receptors to contaminated subsurface soil via dermal contact or incidental ingestion of particulates or the inhalation of particulates or vapors.

6.2 General Response Actions

General response actions for each of the affected media at the project site have been identified and are described in the following subsections. Although these general response actions include no action as a remedial option, the no action response does not address the RAOs identified in the preceding section and is included for comparison purposes only. The general response actions are summarized in Table 10.

6.2.1 Surface Soil/Fill

General response actions available to satisfy the RAO identified for surface soil/fill include:

- No action
- Excavation and off-site disposal of surface soil/fill with concentrations exceeding commercial use SCGs and backfilling the excavation with clean soil
- Excavation and off-site disposal of the most highly contaminated areas of surface soil and covering of the remaining soil with a clean soil cover system
- Covering the site with a clean soil cover system

- Placement of deed restrictions on the property

Because the contaminants of concern include metals, other alternatives such as treatment and stabilization are not practical on the scale of the project site when compared to the response actions identified above.

6.2.2 Subsurface Soil

General response actions available to address the RAO for subsurface soil include:

- No action
- Excavation and off-site disposal of subsurface soil/fill with concentrations exceeding commercial use SCGs or petroleum nuisance characteristics and backfilling the excavation with clean soil
- Removal and off-site disposal of subsurface soil/fill of the most highly contaminated areas and backfilling the excavation with clean soil
- Covering the site with a clean soil cover system
- Placement of deed restrictions on the property

6.3 Remediation Areas and Volumes

Remediation areas and volumes have been estimated based on the results of the site investigation. The estimated areal extent of the surface and subsurface remediation areas using commercial use SCGs are presented in Figure 8. Cleanup to commercial standards will facilitate the planned reuse of the project site. Site remediation to the unrestricted use guidelines would include a significantly greater volume of subsurface soil removal and may not be achievable due to background concentrations. Because cleanup to commercial standards will facilitate the planned reuse of the project site, the additional expense to achieve unrestricted use standards is not warranted.

6.3.1 Surface Soil/Fill Volume

The impacted surface soil/fill varies across the site. Concentrations of total lead ranged from 32.7 ppm to 53,200 ppm with the highest concentrations mostly located along the northwest border of the site in the vicinity of TP-C. High concentrations were also identified on the northeast portion of the former building slab in the vicinity of SS-15. More moderate concentrations are located along the balance of the northeast half of the site. Concentrations along the southern portion of the site are below commercial SCGs and that area will not require remedial measures.

Although arsenic was detected above commercial use values in SS-12, this concentration is indicative of background concentrations as demonstrated in the background soil sample results.

Additionally, the concrete floor slab from the former building appears to have restricted the metal and SVOC contamination to the soil/fill material lying on top of the slab as was summarized in Sections 4.2 and 4.3 of this report. Concentrations of SVOCs and metals below the concrete slab did not exceed the commercial use cleanup objectives. For this reason the surface soil above the concrete slab and the surface soil on the remaining portions of the site are described separately in the subsequent sections of this report.

6.3.1.1 Surface Soil/Fill Overlying the Concrete Slab

Approximately six inches of soil/fill overlies the approximately 25,310 square foot concrete slab. This results in 470 cubic yards (752 tons) of contaminated soil/fill that would be removed in Alternative B. The area of limited excavation proposed in Alternative D is 8,680 square feet at six inches deep, resulting in 161 cubic yards (260 tons) to be removed.

6.3.1.2 Surface Soil/Fill Outside the Concrete Slab

The areal extent of impacted surface soil/fill in other portions of the site is shown on Figure 8 and equals approximately 52,600 square feet. The analytical data indicates that the majority of the site contamination is limited to an average depth of one foot below grade. To ensure the removal of all surface contamination, the removal of the uppermost two feet of soil is recommended. Because soil/fill below one foot has been shown to contain low concentrations of contaminants, the conservative excavation of two feet of surface soil/fill will be sufficient for the removal of contaminated surface soil and therefore verification sampling after excavation should not be required.

The removal of two feet of material across the impacted area equates to a volume of approximately 3,825 cubic yards (6,120 tons) of contaminated soil/fill above commercial use SCGs, not including Area C. Due to the hazardous characteristics of Area C, this material is considered separately and includes approximately 75 cubic yards (120 tons) of contaminated surface soil/fill that is considered hazardous waste.

For Alternative D, an area of 7,340 square feet of surface soil/fill around TP-C would be removed to two feet deep for a volume of 544 cubic yards (870 tons).

6.3.2 Subsurface Soil/Fill Volume

The extent of contaminated subsurface soil/fill material has been delineated using field observations and analytical data from test pits and borings. The approximate extents of subsurface contaminated soils are depicted on Figure 8 as Areas A through C. Because the uppermost two feet of soil will be removed from each of these areas as described above, the volume estimates for these areas do not include that quantity.

6.3.2.1 Area A

This area contained elevated PID readings and petroleum staining and odors. This area includes the former 300-gallon UST location and also encompasses the TP-F location. The sample collected from TP-F from an impacted interval at eight feet below grade contained SVOC TICs but very low concentrations of only two SVOCs. To remove the nuisance characteristics, remediation will be completed to 10 feet below grade, resulting in an approximate soil volume of 1,245 cubic yards (1,992 tons).

6.3.2.2 Area B

SVOC soil contamination was detected at TP-15 at 1-1.5 feet below grade and appeared to extend to approximately 4 feet below grade based on field observations. Analytical results from TP-16 indicate that the contamination in the vicinity of that sample is limited to the surface. The estimated extent and depth of Area B result in an approximate soil volume of 90 cubic yards (144 tons). Confirmation sampling for SVOCs would be completed to ensure that the contamination has been removed.

6.3.2.3 Area C

Elevated concentrations of arsenic and lead were detected at 2 to 2.2 feet below grade at TP-13. The impacted material in this test pit appeared to be backfill placed around a pipe to a depth of four feet. Due to the high lead concentration in the TCLP sample, Area C is considered to be hazardous soil. The metals concentrations in sample collected at 4.5 to 5 feet below grade were less than the commercial use SCGs and minimally above the unrestricted use SCG for only arsenic. The total estimated volume of Area C (including the surface soil removal) is 150 cubic yards (240 tons) of hazardous soil. Confirmation samples will be necessary to ensure all metal contaminated soils were removed from this location.

Therefore based on the observations made during the investigation, it is anticipated that the total volume of subsurface soil contamination is 1,335 cubic yards (2,136 tons) of non-hazardous soils and 150 cubic yards (240 tons) of hazardous soils.

6.4 Development of Alternatives

The general response actions identified in Section 6.2 have been assembled into a series of site-wide remedial action alternatives. These alternatives are summarized in Table 10 and outlined in the following subsections.

6.4.1 Alternative A – No Action

This alternative represents the "No Action Alternative". Under this alternative, the site would remain in its current state and no environmental monitoring, remedial activities, institutional or additional access controls would be implemented. This alternative does not satisfy the RAOs for the current use scenario, nor is it supportive of the planned use of the project site for commercial or light industrial uses. It has, however, been retained for detailed analysis to provide a point of comparison for more intensive alternatives.

6.4.2 Alternative B – Removal of Contaminated Soil/Fill

This alternative is the most comprehensive, involving the removal and off-site disposal of all soil/fill that exceeds commercial use cleanup objectives from the site. Following the excavation and off-site disposal of contaminated surface and subsurface material, clean fill would be brought on-site and used for backfilling the excavation.

The details of the remedial approach are:

- In the area of the concrete slab, remove and dispose of all overlying soil/fill.
- Excavation and off-site disposal of the upper two feet of surface soil/fill over the remaining portions of the site that contain elevated contaminant concentrations.
- Excavation and disposal of isolated areas of contaminated subsurface soil as depicted on Figure 8.
- Backfilling the excavations with clean soil.
- Placing a deed restriction on the property for future development to be limited to commercial or industrial uses.

This alternative satisfies all of the RAOs and is the most comprehensive for this property's future intended commercial use.

6.4.3 Alternative C - Construct a Cover System

This alternative would include placing either three inches of asphalt or concrete with six inches of stone subbase or twelve inches of cover soil over the entire property. Following placement of the cover material, commercial redevelopment could occur on the property, although a soil/fill management plan would be required to address any future invasive activities at the project site. To mitigate the threat of erosion of the cover system and exposure of the underlying soil/fill, long-term monitoring of the cover system would also be necessary.

The details of the program are:

- Either placement of a minimum of twelve inches of clean cover soil followed by seeding area or a minimum of three inches of asphalt or concrete with six inches of stone subbase across the entire site.
- Annual monitoring of cover system.
- Placing a deed restriction on the property that limits future development to commercial or industrial uses, requires the use of a soil/fill management plan for future invasive activities that may take place on the project site, and requires the installation of a vapor barrier in all on-site buildings.

While this alternative would achieve stabilization of the surface soil and protection of human health, it would not remove any of the contaminated media from the project site.

6.4.4 Alternative D – Limited Excavation and Cover System Installation

This alternative would include the excavation and removal of the hazardous soil in Area C as well as areas two areas (TP-C/TP-14 and SS-15) of surface soil having high total lead concentrations. A cover system of either three inches of asphalt or concrete with six inches of stone subbase or twelve inches of cover soil will also be placed over the entire property. Following placement of the cover material, commercial redevelopment could occur on the property, although a soil/fill management plan would be required to address any future invasive activities at the project site. To mitigate the threat of erosion of the cover system and exposure of the underlying soil/fill, long-term monitoring of the cover system would also be necessary.

The details of the program are:

- Removal of four feet of hazardous soil from Area C as depicted on Figure 8.
- Removal of surface soil having high concentrations of total lead from the areas around TP-C/TP-14 and SS-15 as depicted on Figure 8.
- Placement of either a minimum of twelve inches of clean cover soil followed by seeding area or a minimum of three inches of asphalt or concrete with six inches of stone subbase across the entire site.
- Annual monitoring of cover system.
- Placing a deed restriction on the property that limits future development to commercial or industrial uses, requires the use of a soil/fill management plan for future invasive activities that may take place on the project site, and requires the installation of a vapor barrier in all on-site buildings.

This alternative satisfies all of the RAOs and facilitates the property's future intended commercial use.

7.0 DETAILED ANALYSIS OF ALTERNATIVES

7.1 General Discussion

The remedial alternatives outlined in Section 6 were individually and comparatively evaluated with respect to the following six criteria as defined in 6 NYCRR 375:

- Overall Protection of Human Health and the Environment
- Compliance with Standards, Criteria, and Guidance
- Short-Term Effectiveness
- Long-Term Effectiveness
- Reduction of Toxicity, Mobility and Volume
- Feasibility

These criteria are discussed in greater detail below. A seventh criterion, community acceptance, will be evaluated by the NYSDEC at the conclusion of the public comment period.

7.1.1 Overall Protection of Human Health and the Environment

This threshold assessment addresses whether a remedy provides adequate protection, and describes how risks posed through each pathway are eliminated, reduced, or controlled. This evaluation allows for consideration of whether the alternative poses any unacceptable short-term or cross-media impacts.

7.1.2 Compliance with Standards, Criteria, and Guidance

A site's remedial program must be designed so as to conform to standards and criteria that are generally applicable, consistently applied, and officially promulgated, and are either directly applicable, or are not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with [6 NYCRR 375-1.10(c)(1)(i)].

7.1.3 Short-Term Effectiveness

The effectiveness of alternatives in protecting human health and the environment during construction and implementation of the remedial action is evaluated under this criterion. Short-term effectiveness is assessed in terms of protection of the community, protection of workers, environmental impacts, and time until protection is achieved.

7.1.4 Long-Term Effectiveness

The evaluation of this criterion focuses on the long-term protection of human health and the environment at the completion of the remedial action. Effectiveness is assessed with respect to the magnitude of residual risks; adequacy of controls, if any, in managing treatment residuals or untreated wastes that remain at the site; reliability of controls against possible failure; and potential to provide continued protection.

7.1.5 Reduction of Toxicity, Mobility and Volume

This evaluation criterion addresses the preference for selecting a remedial action alternative that permanently and significantly reduces the volume, toxicity, and/or mobility of the hazardous wastes and/or constituents. This preference is satisfied when the treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media. The following is the hierarchy of remedial technologies ranked from most preferable to least preferable:

- Destruction
- Separation/treatment
- Solidification/chemical fixation
- Control and isolation

7.1.6 Feasibility

A feasible remedy is one that is appropriate for site conditions, is capable of being successfully carried out with available technology, and considers, at a minimum, implementability and cost-effectiveness.

7.2 Individual Analysis of Alternatives

The evaluations of the six criteria discussed above for each of the remedial alternatives are presented in the following subsections and summarized in Table 14.

7.2.1 Alternative A – No Action

7.2.1.1 Overall Protection of Human Health and the Environment

The No Action Alternative does not satisfy the RAOs because of its inability to eliminate the potential for the exposure of the public and future construction and site residents to on-site contaminants. Therefore, this alternative is not protective of human health with respect to the surrounding community because contamination would remain on-site and would not be effectively contained.

7.2.1.2 Compliance with Standards, Criteria, and Guidance

The surface soil/fill and subsurface soil containing elevated contaminant concentrations would remain on-site.

7.2.1.3 Short-Term Effectiveness

Under this alternative, the project site would remain in its current state, in which soil/fill with elevated concentrations of contaminants is exposed at the surface of the project site.

7.2.1.4 Long-Term Effectiveness

In the long-term, the City's proposed redevelopment of the project site for commercial or light industrial uses is not possible without remediation. Although bioremediation will eventually address the petroleum contamination, the surface soil/fill will still contain elevated concentrations of metals.

7.2.1.5 Reduction of Toxicity, Mobility and Volume

This alternative would not reduce the toxicity, mobility or volume of contamination.

7.2.1.6 Feasibility

As this alternative requires no action at the project site, this alternative is considered to be implementable. There is no cost associated with this alternative. However, this alternative does not effectively protect human health and the environment.

7.2.2 Alternative B – Removal of Contaminated Soil/Fill

7.2.2.1 Overall Protection of Human Health and the Environment

This alternative would achieve the RAOs for all contaminated media.

7.2.2.2 Compliance with Standards, Criteria, and Guidance

All contaminated materials that exceed commercial use SCGs would be removed from the site and properly disposed. While the underlying reworked material may contain some metals at concentrations above the unrestricted use SCGs, these concentrations would generally be consistent with background concentrations.

7.2.2.3 Short-Term Effectiveness

Although short-term exposure risks to construction workers and the surrounding community could result from remediation activities at the site, these risks would be effectively minimized through the use of a soil/fill management plan and standard construction and health and safety precautions. This remedial action could be implemented in less than a year.

7.2.2.4 Long-Term Effectiveness

This alternative would address exposure to site contaminants in the long-term, as all the contaminated surface material will be removed from the project site and properly disposed. Additionally, all subsurface soils exceeding commercial regulations will be removed from the project site and properly disposed. Long-term operation, maintenance, and monitoring (OM&M) of the remediation would not be necessary.

7.2.2.5 Reduction of Toxicity, Mobility and Volume

This remedial action alternative would effectively reduce the toxicity, mobility and volume of the contaminants through removal and proper off-site disposal of all surface soil and as well as subsurface soil that exceeds commercial use SCGs. However, subsurface soils exceeding unrestricted use SCGs may remain on-site although at a reduced volume than currently present on-site.

7.2.2.6 Feasibility

This remedial action alternative is appropriate for current and future site conditions and uses. Materials and equipment for completing remediation as described are readily available. As shown in Table 11, the estimated cost of this alternative is approximately $940,670, which makes this alternative the most expensive by approximately three times the next most costly alternative.

7.2.3 Alternative C - Cover System

7.2.3.1 Overall Protection of Human Health and the Environment

This alternative would limit the potential for contact with the contaminated media but would not remove the contamination from the site, including hazardous levels of lead. Long-term monitoring would be required.

7.2.3.2 Compliance with Standards, Criteria, and Guidance

A cover system would be placed over the contaminated surface soil/fill to limit the potential for contact with the material. However, all soil/fill with elevated concentrations of SVOCs and metals would remain at the project site, including hazardous levels of lead.

7.2.3.3 Short-Term Effectiveness

Although short-term exposure risks to construction workers and the surrounding community could result from remediation activities at the site, these risks would be effectively minimized through the use of a soil/fill management plan and standard construction and health and safety precautions.

This remedial action could be implemented in less than a year.

7.2.3.4 Long-Term Effectiveness

This alternative would address exposure to site contaminants in the long-term, as the contaminated material will be covered. However, the cover must be maintained in perpetuity and adherence to a soil/fill management plan would be required for all future invasive activities at the project site.

7.2.3.5 Reduction of Toxicity, Mobility and Volume

This remedial action alternative would reduce the mobility of the contaminants in the surface soil/fill but not reduce the toxicity or volume of the contaminated material and would not reduce the toxicity, mobility and volume of the subsurface contaminants.

7.2.3.6 Feasibility

This remedial action alternative is appropriate for future site uses. Materials and equipment for completing remediation as described are readily available. As shown in Table 12, the estimated cost of this alternative is approximately $165,261, which makes this alternative the most cost-effective alternative.

7.2.4 Alternative D – Limited Excavation and Cover System Installation

7.2.4.1 Overall Protection of Human Health and the Environment

This alternative would remove the soil/fill that is most highly contaminated and limit the potential for contact with the remaining contaminated media. Long-term monitoring would be required.

7.2.4.2 Compliance with Standards, Criteria, and Guidance

Soil/fill that is the most highly contaminated would be removed and a cover system would be placed over the remaining contaminated surface soil/fill to limit the potential for contact with the material. However, some soil/fill with elevated concentrations of SVOCs and metals would remain at the project site.

7.2.4.3 Short-Term Effectiveness

Although short-term exposure risks to construction workers and the surrounding community could result from remediation activities at the site, these risks would be effectively minimized through the use of a soil/fill management plan and standard construction and health and safety precautions.

This remedial action could be implemented in one construction season.

7.2.4.4 Long-Term Effectiveness

This alternative would address exposure to site contaminants in the long-term, as the most highly contaminated material will be removed and remaining material will be covered. However, the cover must be maintained in perpetuity and adherence to a soil/fill management plan would be required for all future invasive activities at the project site. In addition, deed restrictions would require that all future building have sub-slab vapor venting systems.

7.2.4.5 Reduction of Toxicity, Mobility and Volume

This remedial action alternative will reduce the toxicity, mobility, and volume of the contaminants in the soil/fill. The contaminated material that will remain has relatively low concentrations and would be covered to reduce its potential mobility.

7.2.4.6 Feasibility

This remedial action alternative is appropriate for future site uses. Materials and equipment for completing remediation as described are readily available. As shown in Table 13, the estimated cost of this alternative is approximately $329,053, which makes this alternative cost-effective.

7.3 Comparative Analysis and Recommendation

A comparative evaluation of the remedial alternatives is presented in the form of a matrix, shown on Table 14, which includes ratings for each of the criteria discussed above. The comparison of the alternatives is based upon a qualitative system that utilizes relative ratings of *high*, *medium* and *low* to define each alternative's performance with respect to the aforementioned criteria. These ratings are then equated to a numerical scale to produce a relative numerical score for final comparison purposes. The ratings equate to the following conditions and numerical scores:

RATING	DESCRIPTION	NUMERICAL RATING
HIGH	SATISFIES CRITERIA TO A HIGH DEGREE	3
MEDIUM	SATISFIES CRITERIA TO A MODERATE DEGREE	2
LOW	MINIMALLY SATISFIES CRITERIA	1

The aggregate numerical score for each of the alternatives evaluated is shown near the bottom of the matrix. Higher relative scores represent a higher level of effectiveness with respect to the evaluation criteria.

As reflected by Table 14, Alternative D has been identified as the most effective alternative. This alternative would satisfy the RAOs developed for the site and would render the site suitable for its proposed commercial use. Alternative C would restrict the mobility of contaminants in the surface soil/fill and reduce the human contact with contaminants of concern but would allow hazardous levels of lead to remain on the site. Alternative B would remove all of the contaminants of concern from site while Alternative D would remove only the material with hazardous levels of lead. However, Alternative D would effectively mitigate any potential exposure to concentrations above the commercial standards via a soil/fill management plan, a site-wide cover, and vapor barriers. Alternative D is approximately one third of the cost of Alternative B and the added benefit realized by removing soil/fill with relatively low concentrations of contaminants in Alternative B does not justify the additional costs, considering that all exposure pathways are eliminated under Alternative D. Therefore, Alternative D is recommended for implementation.

8.0 SUMMARY AND CONCLUSIONS

A Remedial Investigation/Alternatives Analysis (RI/AA) program was implemented at the Niagara Motors site on behalf of the City of Dunkirk. The project site is located at 760 Lamphere Street in the City of Dunkirk, New York. The City and Chautauqua County have identified the project site as a prime candidate for restoration and redevelopment.

The City received State financial assistance to conduct this program under the Environmental Restoration, or Brownfield, component of Title 5 of the Clean Water/Clean Air Bond Act of 1996. The objective of this program was to characterize the site and determine the nature and extent of contamination in the surface soil/fill, subsurface soil, and groundwater. The resulting data was used to qualitatively evaluate potential risks to human health and the environment associated with current site conditions and potential future use scenarios. Based on these findings, remedial alternatives were identified, evaluated, and compared.

8.1 Site Conditions

The former Niagara Motors Site consists of approximately 2.02 acres of land located to the northwest of the intersection of New York State (NYS) Route 60 and Ice Cream Drive in Dunkirk, New York. No aboveground structures, other than power poles, are currently present on the project site. The project site has been used for various industrial purposes from at least 1919 through the 1970's. Operations ceased in the 1970's and the on-site industrial building was abandoned approximately 10 years later. As a result, the building fell into disrepair and was demolished in the year 2000. The site has been vacant since that time.

Based upon the historical use of the project site, the following potential environmental concerns were identified in connection with the project site:

- The previously documented presence of petroleum-impacted surface soil and floor surfaces on the project site.
- The presence of discolored surface soil and stressed vegetation on the project site.

- The potential for surface and subsurface contamination in connection with the former use of the site for industrial/manufacturing purposes for over 80 years. Contaminants of concern include:
  - o Polychlorinated biphenyls (PCBs) stemming from the probable operation and maintenance of former PCB-containing electrical equipment.
  - o Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals related to the former industrial/manufacturing operations completed at the project site.
- The potential for contamination resulting from leaks and/or spills of petroleum products from unsecured drums previously present on the project site.
- The potential presence of a documented 14,000-gallon UST and the potential for other undocumented USTs.
- The potential for contaminant migration from adjacent properties including an electrical substation formerly situated to the south and the rail facilities to the north of the project site.

8.2 Investigation Approach

The Remedial Investigation was conducted in accordance with the NYSDEC-approved February 2005 Remedial Investigation/Alternatives Analysis Work Plan (Work Plan). This investigative work included the following activities:

- Boundary and Site Survey
- Geophysical Survey
- Test Pit Excavations
- Background Soil Sampling
- Surface Soil Sampling
- Test Boring Advancement
- Subsurface Soil Sampling
- Monitoring Well Installation
- Groundwater Elevation Monitoring
- Groundwater Sampling
- Data Validation
- Data Evaluation

8.3 Physical Setting

The topography of the project site is generally flat with a gentle slope downward to the north. The southwestern portion of the project site is lower and periodically retains surface water based on observations of standing water and the type of vegetation present. The site has an elevation of approximately 645 feet above mean sea level (AMSL) based upon the USGS topographic mapping of the area.

The results of the remedial investigation indicate that soil/fill and reworked native material overlie the native soil across the entire site. A thin veneer of soil/fill material with a significant quantity of metal shavings and internal combustion engine parts/pieces was present throughout the project site. Underlying this material was reworked clayey-silt native soil that was underlain by native soils. Weathered shale was encountered at approximately twelve feet below grade across the site.

Groundwater was present at depths ranging from approximately three to six feet below the existing ground surface during the 2006 investigations, and groundwater flows generally to the north.

8.4 Nature and Extent of Contamination

8.4.1 Surface Soil/Fill

Throughout the majority of the site, the surface soil/fill at the project site contains metals (primarily arsenic and lead) at elevated concentrations, and elevated concentrations of SVOCs were also encountered at a few sampling locations. The elevated concentrations of metals in the surface soil/fill are likely due to the historical operations at the project site and the presence of metal shavings in the soil/fill material. The elevated concentrations of SVOCs, primarily PAHs, are likely related to the use and storage of petroleum products at the project site. Figure 8 shows the areas containing contaminants of concern in the surface soil/fill.

8.4.2 Subsurface Soil Material

The investigation results indicate that the contaminants of concern in the subsurface soil consist of SVOCs, metals, and the petroleum nuisance characteristics of odors and staining. Although nuisance characteristics were identified in a number of subsurface soil investigation locations, the concentrations of VOCs and SVOCs in the subsurface soil/fill were generally low. The areas impacted by elevated concentrations of SVOCs and metals and by petroleum nuisance characteristics were limited in extent. Figure 8 shows the contaminants of concern in the subsurface soil/fill and estimated areas of impacted soils.

8.4.3 Groundwater

Groundwater at the project site was encountered at relatively shallow depths and generally flows to the north. Elevated concentrations of contaminants were not detected in the groundwater samples collected at the project site.

8.5 Contamination Assessment

8.5.1 Potential Receptors

Under current (vacant) and planned future use (commercial or light industrial uses) conditions, potential human receptors for on-site contaminants include persons:

- Working or trespassing on the project site
- Living and working in the area surrounding the project site
- Working in or attending the nearby public elementary school

Potential environmental receptors include wildlife living on and migrating through the project site (e.g., rodents, birds, etc.).

If remedial activities were implemented at the project site, potential human receptors during construction would include site workers involved in excavation activities and persons living in and traveling through the area surrounding the project site, including persons working in and students attending the nearby school. The potential for exposure would be minimized through the implementation of a soil/fill management plan and standard construction techniques.

8.5.2 Exposure Pathways

Under current conditions, human and environmental receptors could be exposed to on-site contaminants via:

- Inhalation of airborne particles or vapors
- Incidental ingestion of, or dermal contact, with the contaminated media

During remediation activities, receptors at and near the project site could be exposed to the on-site contaminants via the inhalation of contaminated dust and vapors, and incidental ingestion of, and/or dermal contact with the contaminated soil/fill. However, the use of appropriate personal protective equipment, dust suppression techniques, and the development and implementation of a soil/fill management plan would minimize the risk of exposure during the remedial activities.

No complete exposure pathways to the contaminants at the project site have been identified in connection with the post-remediation period, assuming that the on-site contaminants have been properly addressed.

8.6 Remedial Action Objectives

Remedial Action Objectives (RAOs) were identified for each of the contaminated media encountered on the project site. These RAOs are based upon the findings of the RI and the anticipated future use of the project site as for commercial or light industrial purposes, and include:

- Surface Soil - Prevent exposure via dermal contact or incidental ingestion of particulates and the inhalation of particulates, windborne transport, and the discharge of contaminated storm water runoff to off-site locations.
- Subsurface soil - Prevent the exposure via dermal contact or incidental ingestion of particulates and the inhalation of particulates or vapors.

8.7 Remedial Alternatives

8.7.1 Alternative A – No Action

Under this alternative, the site would remain in its current state and no environmental monitoring, remedial activities, institutional or additional access controls would be implemented.

8.7.2 Alternative B –Removal of Contaminated Soil/Fill

This alternative includes the removal of all contaminated surface and subsurface soil/fill with contaminant concentrations over commercial use SCGs from the project site. The soil/fill impacted with petroleum nuisance characteristics would also be removed form the site. A deed restriction would be required to limit future use to commercial or industrial purposes.

8.7.3 Alternative C- Cover System

This alternative includes the placement of a clean cover over the entire site. Additionally, a deed restriction would be placed on the property requiring the implementation of a soil/fill management plan for all future invasive activities, the maintenance and annual monitoring of cover system, and the installation of a vapor barrier in all on-site buildings.

8.7.4 Alternative D – Limited Excavation and Soil Cover Installation

This alternative combines removal of the most highly contaminated soil/fill with the placement of a clean cover over the entire site. Additionally, a deed restriction would be placed on the property requiring the implementation of a soil/fill management plan for all future invasive activities, the maintenance and annual monitoring of cover system, and the installation of a vapor barrier in all on-site buildings.

8.8 Recommended Alternative

Based upon the degree of protection to human health and the environment afforded by this alternative as well as its high degree of implementability, cost-effectiveness as well as this site's intended future use, Alternative D is recommended for implementation.

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INTERIM REMEDIAL MEASURES REPORT

NIAGARA MOTORS SITE

(NYSDEC SITE NO. E907025)

760 LAMPHERE STREET

CITY OF DUNKIRK

CHAUTAUQUA COUNTY, NEW YORK

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2004.0124.01 April 2008

INTERIM REMEDIAL MEASURES (IRM) REPORT

NIAGARA MOTORS SITE
(NYSDEC SITE NO. E907025)

760 LAMPHERE STREET

CITY OF DUNKIRK

CHAUTAUQUA COUNTY, NEW YORK

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1.0 INTRODUCTION

Two Underground Storage Tanks (USTs) were encountered during the October 2005 test pit investigation while determining the sources of the identified magnetic anomalies as defined during the Remedial Investigation. One tank was located at the TP-D location. This UST was large and was initially believed to be the 14,000-gallon fuel oil tank that was reported during previous environmental investigations. The other UST, located in the vicinity of TP-M, was an approximately 300-gallon tank that appeared to be full of water. The locations of the test pits and the former locations of the USTs are shown on Figure 3 of the Remedial Investigation Report.

An Interim Remedial Measure (IRM) was conducted that included the removal of each UST from the project site and the proper disposal of each tank and their contents. TVGA subcontracted the tank removal work to Global Environmental and Industrial, Inc. (GEI). The Chautauqua County Department of Public Facilities (CCDPF) provided an excavator, operator and laborer to physically remove the USTs and provide labor and UST transportation assistance. TVGA completed oversight of the IRM operations. Photographs are included as Attachment D.

2.0 TANK REMOVAL

On October 23, 2006, TVGA, GEI, and CCDPF mobilized the equipment and personnel to excavate and remove the USTs from the project site. Excavation work began in the former test pit TP-M area to uncover the 300-gallon UST. When uncovered, the UST had one puncture on its top side which was likely due to the October 2005 test pit work but, otherwise was in good condition. Two uncapped, two-inch diameter access ports were present from which the tank contents were assessed. Even though there was no plume of contamination observed to be emanating from the tank area, petroleum odors were detected in the surrounding soils and the tank was full of water. Approximately 235 gallons of water were pumped into five steel 55-gallon drums. After removal from the ground, the UST was cut open and the remaining sludge was removed and containerized in a steel 55-gallon drum. Because this UST was located within a large area of petroleum impacted soils, as identified during previous investigation activities, no confirmatory samples were collected by GEI. Due to the area’s relatively large size and correspondingly large volume of impacted soil and the fact that the City did not own the property, the expense of removal of this material could not be justified.

After completion of backfilling activities for the above referenced excavation, GEI and CCDPF began work at the test pit TP-D location to access the reputed 14,000-gallon fuel oil tank. Preparations were made to stage impacted soils, if necessary. GEI personnel utilized a PID to facilitate TOV monitoring of the excavated materials.

When uncovered, this large UST was found to be in excellent condition with no uncapped openings. There was no plume of contamination observed to be emanating from the tank area. However, a small area of subsurface soil immediately adjacent to the tank was discolored (dark grey) and exhibited a petroleum odor and slightly elevated PID readings (10 to 15 ppm). As such, these soils were segregated from the non-impacted soils and staged on and covered with polyethylene sheeting. Soil with no evidence of contamination was stockpiled on site for later use as backfill.

As determined by GEI, the actual tank capacity was 9,000 gallons. Although still large, the tank was smaller than the historically referenced size. An approximately three-inch pipe, likely the filler port, was lifted off the tank to access the contents. The UST was full of water with approximately two inches of sludge at the bottom. TVGA contacted the City of Dunkirk waste water treatment plant (WWTP) regarding disposal of this water. Mr. Paul Hayden, WWTP Operator, informed TVGA that the facility could accept the water assuming the Oil and Grease (O&G) and Flashpoint (FP) levels were within acceptable limits. Since no characterization had been completed on this water and considering the large quantity of water present, GEI ordered a "Baker" holding tank into which the water was pumped.

The Baker tank was transported to the project site on October 24, 2006. After cutting an opening into the tank, the water was pumped into the Baker tank. When the pumping was completed, the water within the Baker tank was sampled for O&G concentration and FP determination. The samples were submitted to Waste Stream Technologies (WST) for the required analytical testing. The analytical results, included in Attachment B, indicate that oil and grease were not detected and the flashpoint was greater than 200^{o}F. These levels are within the City of Dunkirk's WWTP limits for wastewater disposal and therefore the Baker tank was transported to the WWTP.

The UST was then removed from the excavation with relatively minimal liquid remaining. After removal, an additional approximately 150 gallons of liquid was pumped into three steel 55-gallon drums, and the sludge was removed from the USTs and containerized in four steel 55-gallon drums. Results for characterization samples collected from the drums are included in Attachment B.

Coincident with UST cleaning, additional GEI personnel collected confirmation samples from the four walls and bottom of the excavation. Disposal characterization samples of the staged, impacted soils were also collected by GEI personnel. The soil samples were also submitted to WST for the following analyses:

- <u>Confirmatory Samples</u>: STARS VOCs/SVOCs
- <u>Impacted Soil Samples</u>: Toxicity Characteristic Leaching Procedure (TCLP) benzene, TCLP lead, FP and polychlorinated biphenyls (PCBs)

An analytical summary table of the stockpiled soil as well as the four excavation walls and a copy of the analytical data are included as Attachment B. None of the parameters analyzed exceeded commercial use cleanup objectives and only one parameter exceeded the unrestricted use cleanup objectives. Acetone was detected at a concentration that exceeded restricted use cleanup objectives in both the east and west excavation walls. The presence of this analyte is likely a laboratory artifact.

After completion of confirmation sampling, the City of Dunkirk Department of Public Works (City DPW) provided additional clean backfill material. Five single-axle dump truck loads of fill were initially placed in the excavation by the City DPW personnel who also placed security fencing along the north and south sides of the excavation. The City DPW completed the backfilling of the excavation on October 30, 2006.

3.0 WASTE REMOVAL

The drums containing the sludge from both USTs were transported by CCDPF personnel to Chautauqua County landfill for disposal. After the USTs were cleaned they were transported and disposed of at O'Brocta's Salvage located on Willow Road, Dunkirk, New York.

On October 30, 2006, TVGA transmitted the GEI supplied analytical testing data for the water staged on-site to Mike Norman, City WWTP Pre-treatment Coordinator. The water was approved for disposal by Mr. Norman the following day. GEI transported the water to the City WWTP with their vacuum truck.

Upon receipt from GEI of the analytical testing data for the staged soil and drummed sludge, TVGA completed the waste characterization permit for the Chautauqua County Landfill (CCLF). The disposal application was signed and submitted by the City and was approved by CCLF on January 22, 2007. Subsequently, 131.39 tons of impacted soil and sludge were transported by Don Frame Trucking, Inc and disposed of by the City at CCLF on February 22, 2006.

The UST/soil/sludge disposal receipts are presented in Attachment C. Attachment D contains photographs of the IRM activities.