CORRECTIVE MEASURES STUDY

FOR:

VAILS GATE
MANUFACTURING, LLC
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VAILS GATE, NEW YORK

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CORRECTIVE MEASURES STUDY

Vails Gate Manufacturing, LLC
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Table of Contents

Table of Contents

TABLES

Figures

EXECUTIVE SUMMARY

This report summarizes the Corrective Measures Study ("CMS") conducted by Leader Consulting Services, Inc. ("Leader") for the former Vails Gate Manufacturing, LLC site at 1073 Route 94, Vails Gate, New York ("VGM" or "the Site"). The Site is the location of a former vinyl floor tile manufacturing facility.

In March of 2012 Leader completed a Phase II Supplemental RCRA Facility Investigation ("RFI") report that identified the presence of chlorinated solvents in excess of New York State Department of Environmental Conservation ("NYSDEC") standards in groundwater samples collected from three (3) monitoring wells (i.e., MW-5A/AR, MW-14 and MW-16 – See Figure 2). Two of these wells (i.e., MW-5A/AR and MW-14) had originally been installed to assess groundwater quality conditions near the below-ground oil/water separator system, identified as Area of Concern 6 ("AOC 6"). The oil/water separator and ancillary tanks and vaults were remediated and closed as part of Interim Remedial Measure ("IRM") activities in 2007. Based upon a review of the Phase II Supplemental RFI report, the NYSDEC requested that a CMS be developed to address groundwater contamination associated with AOC 6.

Initially, broadly defined general response actions were identified for AOC 6, where a response was deemed necessary to protect public health or the environment based on the RFI conducted at the Site. Technologies for each general response action were identified and preliminarily screened solely on the basis of their effectiveness and technical feasibility. The technologies that were retained through this initial screening process were then used to develop remedial alternatives for AOC 6.

Screening involved evaluating these remedial alternatives primarily on the basis of effectiveness and implementability. Those alternatives passing this second phase of screening were assembled into the following four (4) remedial alternatives for AOC 6.

Alternative 1: No Action:

Alternative 2: Limited Action;

Alternative 3: In-Situ Bioremediation; and

Alternative 4: Pump and Treat.

The potential remedial alternatives for AOC 6 were subjected to a detailed evaluation based on the following criteria: 1) overall protection of human health and the environment; 2) compliance with New York State Standards, Criteria and Guidelines ("SCGs"); 3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility, and volume; 5) short-term impact and effectiveness; 6) implementability; 7) cost effectiveness; 8) land use; and 9) community acceptance. Alternatives were then compared to select an environmentally sound and cost-effective remedial action for AOC 6. Remedial alternative criteria 9, State and community acceptance of the results of the

CMS, will be evaluated after a public hearing to be held prior to the NYSDEC's issuance of a Record of Decision ("ROD").

The remedial costs associated with each alternative were estimated based on vendor information, engineering cost estimates, generic unit costs and prior experience. Based on discussions with NYSDEC, the total present worth costs for each alternative were estimated using a 1 percent discount rate for a five (5) year time period associated with implementation of the specific alternatives.

Based upon the evaluation of the four (4) alternatives with respect to the eight (8) evaluation criteria (the ninth criteria, community acceptance, is applied after development and selection of alternatives based on the first eight (8) criteria), In-situ bioremediation is recommended for AOC 6.

This alternative involves the in-place biotreatment of the chlorinated contaminants associated with AOC 6. This alternative is recommended for AOC 6 for the following reasons:

- This alternative satisfies the requirements for protection of human health and the environment, and will be designed to satisfy the applicable SCGs.
- No soil is disrupted as a result of this remedial action, limiting the effects of the remediation upon public health and the surrounding community.
- The costs of implementing other feasible alternatives for AOC 6 were greater than the costs for implementing the recommended alternative.

This alternative meets all of the remedial action objectives for AOC 6 in a cost-effective and technically feasible manner in comparison with the other alternatives evaluated. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled.

Following public acceptance of the CMS, a remedial workplan will be developed for AOC 6. The workplan will include a description of the following:

- Site Preparation and Mobilization;
- Remedial Activities;
- Target Analytes for AOC 6;
- Identification of Cleanup Levels and Integration of Reuse Options;
- Sampling and Analytical Testing Protocols;
- Quality Assurance/Quality Control Procedures;
- Decontamination Protocols; and
- Reporting Requirements.

1. INTRODUCTION

This report summarizes the CMS conducted by Leader for the Vails Gate Manufacturing, LLC Site in Vails Gate, New York. Figure 1 is a Site Location Map and Figure 2 is a Site Plan. The Site is the location of a former vinyl floor tile manufacturing facility. The purpose of this CMS was to identify and evaluate potential cost-effective remedial alternatives to address residual groundwater contaminants near AOC 6, the former oil/water separator at the Site. This CMS is focused on remedial actions that effectively address groundwater impacted by chlorinated solvents near AOC 6 through the application of Federal and State standards and guidance documents. Figure 1 presents a Site Location Map and Figure 2 is a Site Plan.

1.1 Basis for CMS

In March of 2012 Leader completed a Phase II Supplemental RFI report that identified the presence of chlorinated solvents in excess of NYSDEC standards in groundwater samples collected from groundwater monitoring wells at the Site. Samples from monitoring wells MW-14 and MW-5A/AR, in the vicinity of a former oil/water separator, exhibited exceedances from samples collected in November of 2011. The wells had originally been installed to address groundwater quality associated with the below-ground oil/water separator system, AOC 6. The oil/water separator and ancillary tanks and vaults were remediated and closed as part of IRM activities in 2007. Based upon a review of the Phase II Supplemental RFI report, the NYSDEC required that a CMS be developed to address groundwater concentrations above applicable NYSDEC standards near AOC 6.

Leader prepared this report based on the criteria identified in the May 25, 2012 letter from Mr. John Miller of NYSDEC to Mr. John Kolaga, Esq. of Damon Morey LLP. This CMS has been prepared in a manner similar to a Feasibility Study ("FS") discussed in Section 4.4(b) of the NYSDEC Guidance Document entitled "DER-10, Technical Guidance for Site Investigation and Remediation." 6 New York Code of Rules and Regulation ("NYCRR") Part 375-1.8(f) provided the criteria to evaluate each remedial alternative identified in this CMS.

While Leader has prepared this CMS in general accordance with the NYSDEC FS program policies, NYSDEC and Federal RCRA laws, regulations and guidance have been addressed in the development of this study:

- National Contingency Plan ("NCP") Final Rule;
- United States Environmental Protection Agency ("USEPA") "Guidance for Conducting Remedial Investigation/Feasibility Studies Under CERCLA," October 1988;
- 6 NYCRR Part 375 "Environmental Remediation Programs," December 2006; and

- NYSDEC Program Policy, Division of Environmental Remediation, DER-10, entitled "Technical Guidance for Site Investigation and Remediation" May 3, 2010.

6 NYCRR Part 375 regulations state that cost-effectiveness and technical feasibility are factors to be considered in remedy selection. However, in preparation of this CMS report, cost was not considered as an evaluation criteria in the Screening of Technologies (Phase I FS) or the Preliminary Screening of Alternatives (Phase II FS). However, cost was considered in subsequent phases of remedy evaluation and selection in accordance with applicable guidance documents.

1.2 Purpose of the CMS

The purpose of this CMS is to evaluate and identify remedial action alternatives, which cost-effectively address exposure pathways, and therefore, limit the risks to human health and the environment resulting from chlorinated analytes detected within the groundwater near AOC 6.

1.3 CMS Overview

This CMS report identifies general response actions, evaluates remedial technologies, and formulates and evaluates potential remedial action alternatives. The CMS process involved the identification of specific response actions, where a response was deemed necessary, to protect public health and the environment based on the 2011 Phase II Supplemental RFI. Technologies for each response action were identified and preliminarily screened on the basis of their effectiveness and technical feasibility. The technologies that were retained through this initial screening process (i.e., the Phase I FS) were used to develop remedial alternatives for the Site.

The CMS then evaluated these remedial alternatives on the basis of effectiveness and implementability (Phase II FS). Those alternatives passing the Phase II FS underwent a detailed evaluation which considered: 1) overall protection of human health and the environment; 2) compliance with SCGs; 3) long term effectiveness and performance; 4) reduction of toxicity, mobility, and volume; 5) short term effectiveness; 6) implementability; 7) cost effectiveness; 8) community acceptance; and 9) land use. Alternatives were qualitatively compared to identify environmentally sound and cost-effective remedial actions for the Site.

1.4 Report Organization

The information contained in this report is in general accordance with NYSDEC and USEPA requirements and the format is in general accordance with Section 4.4(b) of the NYSDEC Guidance Document entitled *"DER-10, Technical Guidance for Site Investigation and Remediation."* The organization of this CMS Report is as follows:

Section 1 Introduction;

Section 2 Site Description and History;

Section 3 Summary of RFI and Exposure Assessment;

Section 4 Remedial Goals and Remedial Action Objectives;

Section 5 General Response Actions;

Section 6 Identification and Screening of Technologies;

Section 7 Development and Analysis of Alternatives;

Section 8 Identification and Recommendation of Alternative;

Section 9 Limitations and Used of Report; and

Section 10 References

2. SITE DESCRIPTION AND HISTORY

The Site, currently identified as the Vails Gate Business Park, is located on property zoned for commercial purposes and is used for warehousing light industry. The surrounding properties include the New York State Thruway to the west, abandoned commercial property to the east, Route 94 to the north, and undeveloped wetlands to the south. The former Vails Gate, New York Manufacturing facility was a manufacturer of vinyl floor tiles from the mid 1960s through late 2005. The manufacturing process involved the mixing of powdered limestone and polyvinyl chloride ("PVC") resin with plasticizers (i.e., liquid oil) and pigments in a Banbury mixer. The resulting mixture was heated and mixed with colored chips. The material was then pressed and rolled to the desired thickness and cooled. A wax coating was applied, and the sheets were cut into 12" by 12" tiles.

The Site has undergone numerous environmental investigations, as summarized below.

1990 Closure and Characterization of the Drum Storage and Staging Areas – This investigation included subsurface soil borings and groundwater sampling. It resulted in an Administrative Order of Consent being issued by NYSDEC requiring a Facility Closure Investigation.

1998 Phase I Environmental Site Assessment ("ESA") – This assessment identified several environmental issues, including the potential releases from the oil/water separator, and suggested implementation of a Phase II ESA.

1999 Phase II ESA – Laboratory results from soil boring samples and groundwater samples placed near the oil/water separator indicated the soil and groundwater were contaminated with Volatile Organic Compounds ("VOCs").

2003 Subsurface Investigation – This investigation focused on identifying the presence of petroleum products in the septic discharge area. Laboratory results indicated that no parameters of concern were detected at or above the method detection limits. However, the samples that were analyzed were composite samples from multiple borings.

2003 Phase I ESA and Environmental Due Diligence Report – This assessment consisted of a Phase I ESA and a regulatory compliance review. The Phase I ESA identified the former oil/water separator as an area of concern.

2003 Phase II Subsurface Investigation – This investigation resulted in identification of contamination near the oil/water separator and a recommendation for further sampling and analysis to further delineate and characterize the impact to Site soils. Based on the laboratory results, NYSDEC was notified and Spill #0306971 was assigned to the oil/water separator area.

2006 Office/Research and Development Building Site Assessment and Background Search – This investigation included no sampling of Site medium and focused on the Office/Research Building to the north of the main manufacturing building.

2006 Spill #0600056 Petroleum Spill Response and Investigation – This investigation was prompted by the discovery of separate-phase products in a catch basin west of the oil/water separator. Liquids and sediments were removed from the catch basin. Results of this investigation are included in the report entitled "Remedial Investigation Report Oil/Water Release Area" which was submitted to NYSDEC in August 2006.

2006 Spill #0610679 Interim Remedial Investigation – This investigation focused on the 20,000 gallon Underground Storage Tank ("UST") at the southern part of the Site. Free petroleum product was discovered within soils adjacent to the tank during the investigation. The tank and contaminated soils were removed from the ground in January 2007 as an IRM.

2007 RFI Work Plan Development and IRM Report – CHA prepared a RFI for the Site and oversaw the removal of the 20,000 gallon UST and the oil/water separator and associated junction box and settling chamber. This IRM involved vacuuming of accumulated liquids, dismantling of a portion of the oil/water separator, removal of a 500 gallon overflow tank and excavation of contaminated soils from within and adjacent to the oil/water separator.

May and July 2007 Soil Vapor Intrusion Investigations and Reports – These reports discuss the second and third round of sub-slab vapor sampling associated with the main building on the Site.

2009 Phase II Supplemental RFI Work Plan and Investigation – This plan was developed by CHA, and was subject to revision by the NYSDEC and the New York State Department of Health ("NYSDOH"). The plan was implemented by Leader in May of 2011, with a final report issued in March 2012.

2.1 CURRENT CONDITIONS

In addition to the Phase II Supplemental RFI completed by Leader, Soil Vapor Intrusion ("SVI") sampling and analysis of specific areas of the main building at the Site have been ongoing. The most recent SVI sampling and analyses was completed by CHA. Analytical results and recommendations from this sampling event are included in the report entitled *"2011/2012 Vapor Intrusion Monitoring and Mitigation System Inspection Report, Former Vails Gate Manufacturing Facility, 1073 Route 94, Vails Gate, New York."* The

report recommendations were that the Area A2 portion of the Built NY's space should continue to be monitored and not mitigated. Based on "*Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, 2006,"* NYSDEC and NYSDOH reviewed the CHA report and concluded that mitigation was necessary for Area A2 (letter from J. Miller to J. Kolaga, Esq., June 5, 2012). As a result of the regulatory agencies' recommendations, CHA is currently designing a mitigation system to address subsurface and indoor ambient vapor issues in the Shock Studios rental space and areas A1 and A2 of the Built NY rental space, should such be determined to be necessary after the implementation and evaluation of the selected Corrective Measures remedy.

3. SUMMARY OF RFI AND EXPOSURE ASSESSMENT

3.1 DETECTED ANALYTES

Past manufacturing operations conducted on the Site included the use of powdered limestone, PVC resins, oils, and plasticizers. The Phase II ESA completed by ENSR in 1999 indicated that soils and groundwater in the vicinity of the oil/water separator were impacted with VOCs. The 2011 Phase II Supplemental RFI completed by Leader included sampling of groundwater near AOC 6. Groundwater monitoring wells MW-14 and MW-5A/AR, the wells originally installed to address subsurface conditions associated with the oil/water separator, detected the presence of chlorinated solvents within samples collected from monitoring wells during three (3) consecutive rounds of sampling (June 2011, November 2011, and July 2012). Per NYSDEC's directive, the third round of groundwater sampling (July 2012) was limited to VOC analyses of samples from six (6) groundwater monitoring wells shown on Figure 2: MW-5A/AR; MW-14; MW-16; MW-CHA-RFI-2; MW-B6 and MW-B3. The most recent results of laboratory analyses of the sample collected from monitoring well MW-5A/AR (July 2012 sampling event) detected Chloroethane, 1,1 Dichloroethane, 1,1 Dichloroethene, 1,1,1 Trichloroethane and Vinyl Chloride above NYSDEC Class GA groundwater standards. The most recent results of laboratory analyses of the sample collected from monitoring well MW-14 (July 2012 sampling event) detected 1,1 Dichloroethane and Vinyl Chloride above NYSDEC Class GA groundwater standards.

3.2 PATHWAY ANALYSES

To assess whether nearby residents and persons on-Site could be exposed to contaminants migrating from the Site, an evaluation was made of the environmental and human components that could lead to human exposure. The pathway analysis consists of five elements: 1) a source or location of contamination; 2) fate and transport through an environmental medium; 3) a point of exposure; 4) a route of human exposure; and 5) exposed population.

An exposure pathway is categorized as a completed or potential exposure pathway if the exposure pathway cannot be eliminated. A completed pathway occurs when the five elements of an exposure pathway link the contaminant source to a receptor population. Should a completed pathway exist in the past, present or future, the population is considered exposed. A potential exposure pathway exists when one or more of the five elements are missing, or if modeling is performed to replace the real sampling data. Potential pathways indicate that exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present. The

following sections incorporate only those pathways that are important or relevant to the Site. There is also a discussion of the pathways that have been eliminated.

3.2.1 Eliminated Exposure Pathways

Soil

During implementation of the IRM in 2007, excavation and removal of contaminated soils from the exterior and interior of the oil/water separator occurred. A limited amount of impacted soil remained in the oil/water separator vault, prior to backfilling the vault and associated excavation. Currently, the soil is contained below the asphalt driveway and parking area and concrete-floored building which serves as an effective barrier.

Air

Ambient air has been sampled at the Site to assess background concentrations of contaminants as part of the ongoing SVI investigation addressing sub-slab and indoor air quality within the buildings at the Site. Background sample location B-1 has been sampled from May 2006 to January 2011 as a Quality Assurance/Quality Control tool to determine if one or more compounds detected in ambient air samples could be attributable to background levels at the Site at the time of sampling. Laboratory results of ambient air samples from this location were all below regulatory thresholds identified in CHA's March 2010 RFI Vapor Intrusion Investigation Report. Ambient air exposures are not expected to be significant as indicated by the SVI sample results from sample location B-1, and due to the presence of the asphalt driveway/parking lot and the indoor concrete floor that cover AOC 6. The SVI investigation is ongoing. Indoor air quality within the plant building continues to be monitored or mitigated at specific locations.

3.2.2 Completed Exposure Pathways

Groundwater

The public drinking water supply in this area is not drawn from the on-Site water bearing zone, therefore, exposure of workers or residents to VOC contaminated water has not occurred. The depth to groundwater at MW-5A/AR, a flush mounted monitoring well in the paved parking area, was 0.18 feet from the ground surface. Exposure of workers may occur in the future due to possible excavation activities. Exposure to contaminants could occur through dermal contact or incidental ingestion. The proposed remediation of contaminated groundwater is expected to reduce or eliminate potential future exposures. In the interim, any excavation activities should be monitored.

3.2.3 Toxicological Evaluation

Construction workers engaging in on-Site excavation activities have the potential for exposure to VOC contaminants through multiple routes. Workers that come into contact with contaminated groundwater during construction activities should be at low risk from exposure to VOCs due to safety measures installed prior to any groundbreaking activities. Individuals engaged in actual remedial activities could also be exposed, however using appropriate personal protective equipment and air monitoring procedures during these activities would minimize the potential risk.

4. REMEDIAL GOALS AND REMEDIAL ACTION OBJECTIVES

General remedial goals are guided by the NCP, 40 CFR 300.68, RCRA Section 3008 (h), and DER-10, Section 4.1(b). The NCP specifies that the objective of every remedial action is to "mitigate and minimize damage to and provide adequate protection of public health, welfare or the environment".

The May 25, 2012 letter from Mr. John Miller of NYSDEC to Mr. John Kolaga, Esq. of Damon Morey LLP, requested that the CMS "evaluate a no further action remedy and an unrestricted use remedy." The "no further action remedy" or ('no action') remedy is incorporated in this CMS as a standard remedial alternative as required by the Superfund Amendments and Reauthorization Act ("SARA") and the May 25, 2012 letter. The "unrestricted use remedy" identified in the letter more accurately represents a standard to achieve, not a remedial technology alternative. As a result, an October 5, 2012 discussion between Mr. Miller and Mr. Keith Keller of Leader established that the "unrestricted use remedy" would be based on the regulatory standard values for Class GA groundwater identified in 6 NYCRR Part 703.5. These were the SCGs used in the Supplemental RFI completed in March 2012. Class GA standards are the most restrictive standards for groundwater and have been established to identify the best use of groundwater as a potable water source. Based on the NYSDEC requirement to apply an unrestricted use approach, the CMS includes the following Site-specific Remedial Action Objectives ("RAOs"):

- Limit incidental ingestion of groundwater containing analyte concentrations which exceed SCGs;
- Limit dermal/skin contact with groundwater containing analyte concentrations which exceed SCGs; and
- Select a remedial alternative that will reduce the concentration of chlorinated solvents within groundwater associated with AOC 6 to levels that does not exceed the SCGs.

Under the unrestricted use standard, the remedial action objectives are not fully satisfied under the current conditions because: 1) the potential for exposure to contaminants exists if subsurface activities in AOC 6 were to occur; and 2) current concentrations of analytes are above Class GA groundwater standards based on two (2) groundwater monitoring wells near AOC 6.

Currently, on-Site groundwater is not extracted and used as a source of potable water (i.e., drinking water), nor is it used for commercial/industrial uses (i.e., cleaning, steam production, etc.). Confining barriers to contaminants within the groundwater and access controls to the Site are currently in place. The current Site land use of the Vails Gate

Business Park is defined as "industrial use" as per 6 NYCRR Subpart 375-1.8(g)(2)(iv). Commercial warehousing and distribution, as well as fabrication and assembly occur within the businesses currently operating at the business park.

Remedial technologies for groundwater treatment (i.e., in-situ bioremediation, groundwater pump and treat, etc.) may not result in achieving groundwater concentrations below the Class GA drinking water standards. Thus, the following Site-specific RAOs have been developed to address any "restricted use" remedial alternatives:

- Future residual groundwater contamination is unlikely to pose exposure concerns to human health and the environment;
- The residual groundwater contamination, if present, will be compatible with the use of the Site;
- Asymtotic conditions (i.e., zero slope) will be reached with regard to groundwater quality (i.e., continued treatment will not result in a decrease in the concentration of analytes at the monitoring wells).

This approach is reasonable based on the following Site-specific conditions:

- The local groundwater currently has no beneficial use and is unlikely to be used in the foreseeable future;
- The present lack of completed pathways of human exposure and the absence of a significant threat to public health;
- The potential technical impracticability of restoring groundwater to the pre-release conditions; and
- The Site's commercial/industrial setting and the absence of sensitive environmental receptors.

5. GENERAL RESPONSE ACTIONS

General response actions describe those actions that satisfy the remedial action objectives. Based on information gathered during the RFI, general response actions, or classes of actions, were identified. The response actions are considered applicable if they generally address the environmental concerns identified in Section 4.0.

Table 5-1 summarizes the general remedial response actions. General response actions considered include the "no further action" alternative, which will serve as a baseline against which other remedial measures can be compared. The "no further action" alternative is mandated for inclusion by SARA. In addition, NYSDEC has requested that the “no further action” alternative be evaluated. Potential remedial technologies are identified for each general response action.

5.1 General Response Actions For Groundwater

General response actions appropriate for groundwater contamination include monitoring and institutional controls treatment. Sampling completed during the Phase II Supplemental RFI June and November 2011 and the July 2012 sampling events indicate that contaminated groundwater has not migrated off-Site.

5.2 General Response Actions for Soil

General response actions for soil address the pathways of ingestion, dermal contact, leaching and fugitive dust transport. However, general response actions for soils are not considered applicable to this CMS. As identified in the May 2007 IRM report, excavation and removal of contaminated soils from the exterior and interior of the oil/water separator was completed. A limited amount of impacted soil remained in the oil/water separator vault prior to backfilling the vault and the associated excavation. Currently, the soil is contained below the asphalt driveway and parking area and concrete-floored building that serve as a barrier to workers. Based on sampling data near AOC 6, there is no longer a chlorinated VOC source. The concentrations detected in the two (2) monitoring wells near AOC 6 are considered residual.

6. IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section includes the identification and screening of remedial technologies considered for the Site. Initially, this section summarizes the findings of the Phase II Supplemental RFI June and November 2011 and the July 2012 sampling events for the Site, as it applies to the CMS. Finally, feasible technologies and process options are identified and screened to provide a basis for the subsequent development of AOC 6-specific remedial alternatives.

6.1 Summary of Media To Be Remediated

The media to be remediated, treated or controlled at the Site is the groundwater that exceeds applicable SCGs. However, as concluded in the Phase II Supplemental RFI, the presence of Site related contaminants in the Site groundwater does not pose a significant threat to human health or the environment based on the current Site use. Potential for human exposure to the impacted media is limited due to the absence of ground invasive activities at the Site. Certain remedial activities, engineering and/or institutional controls are sufficient to limit the potential exposure of construction workers at the Site.

The Phase II Supplemental RFI concluded that groundwater contamination at the Site is limited to AOC 6. Analytical data from groundwater samples collected from monitoring wells MW-5A/AR, MW-14, and MW-CHA-RFI-2, collected during June and November 2011 and July 2012, indicate that VOC groundwater contamination appears localized near the former oil/water separator. The highest chlorinated VOCs detected in groundwater above SCGs near AOC 6 are summarized below. This area of limited groundwater contamination is addressed in this CMS through groundwater remediation alternatives.

6.2 Identification of Applicable Remedial Technologies

Table 6-1 summarizes the applicable remedial technologies and process options for AOC 6. These applicable remedial technologies include a specific list of technologies available within each of the general remedial response actions identified in Section 5.0.

No Action

The "No Action" alternative is mandated by SARA and specifically requested by NYSDEC in the May 25, 2012 letter. Under the No Action alternative, natural attenuation would occur at the Site, which has the potential of reducing contaminant concentrations in groundwater near AOC 6.

Limited Action

Limited Action involves continued groundwater monitoring to assess future attenuation of chlorinated VOCs in the groundwater near AOC 6. Additionally, limited Action would include institutional actions that involve access restrictions and/or use controls. Such restrictions or controls would include deed restrictions and limiting access to specific areas of the Site, and/or environmental easements limiting the future use of the Site.

On-Site Treatment

On-Site treatment is a general group of technologies that involves treating groundwater through the use of chemical or biological agents or physical manipulations, which degrade, remove, or immobilize contaminants. Some of these treatment technologies can be implemented in-situ, without removing the groundwater, while others are more effective using an ex-situ treatment process.

The in-situ treatment process considered for the Site is bioremediation. In-Situ Bioremediation ("ISB") is a technique for treating contaminated groundwater in place by enhancing aneorobic bioremediation of chlorinated VOCs. The technology involves enhancing the natural biodegradation process by injecting nutrients, oxygen, and cultured bacterial strains or by introduction of genetically engineered microbes. Bioremediation can provide substantial reduction in organic contaminant levels in groundwater. A number of site-specific factors, such as site geology, soil characteristics, and aquifer characteristics, are critical in evaluating the implementability of this technology.

Pump and Treat technology is the process of removing contaminated groundwater from the ground and processing it through an on-Site treatment system that removes the chlorinated VOCs from the groundwater. The treated groundwater is discharged to the local sanitary sewer or returned to the ground at or near the location it was drawn from. The process continues until the treated groundwater meets the SCGs applicable to the Site. Typical treatment techniques for chlorinated VOCs in groundwater include filtration, carbon absorption, air stripping or vapor extraction.

6.3 Screening of Applicable Remedial Technologies

An initial screening of potentially applicable remedial technologies and process options for the Site was completed based on technical implementability. Table 6-2 summarizes this screening of technologies and process options. Technical implementability, as per DER-10, involves an evaluation of each technology based on the following:

- Technical feasibility with construction of the remedial technology and the ability to monitor the effectiveness of an alternative or remedy;
- Administrative feasibility, including assessing the availability of necessary personal and material, and potential difficulties in obtaining specific operating approvals, access for construction, etc.; and
- Evaluation of the reliability and viability of the institutional or engineering controls necessary for a remedy.

This initial screening process has identified the technologies with the greatest potential for applicability to the Site characteristics and constituents of concern. They have been retained and are evaluated further in the subsequent sections of this report.

Based on the screening and evaluation processes discussed above (Phase I FS), the following combinations of remedial technologies and process options have been retained for further consideration:

- No Action;
- Limited Action;
- On-Site Treatment – In-Situ Bioremediation; and
- On-Site Treatment – Pump and Treat

6.4 Evaluation of Technologies and Process Options

The technologies and process options considered to be "implementable" were evaluated on the basis of effectiveness and implementability. Relative cost was also reviewed; however, cost was not used as the sole criteria to screen-out any of the technologies or process options. A summary of the evaluation criteria is presented below.

Effectiveness

Effectiveness refers to the degree to which a technology achieves the remedial action objectives. As this evaluation pertains to technologies rather than overall remedial alternatives, a technology need not achieve the remedial objective in its entirety to be considered effective. Effective technologies may be combined with other complementary technologies, if required, to form effective alternatives to achieve the remedial objectives. Thus, this evaluation is based upon the effectiveness of each technology at its intended site-specific function.

Implementability

Implementability encompasses both the technical and administrative feasibility of implementing a technological process. Technical implementability is used to initially screen technologies and to eliminate those that are clearly ineffective or unworkable at a site. Thus, this subsequent and more detailed evaluation of technologies places greater emphasis on the institutional aspects of implementability, such as the ability to obtain the necessary permits for off site actions, the availability of treatment, storage and disposal services (including capacity), and the availability of necessary equipment and skilled workers to implement the technology.

Cost

Relative capital and operation and maintenance ("O&M") costs were estimated during this stage of the screening process. The cost estimates were made on the basis of published unit costs and vender estimates, and each process option is evaluated as to whether costs are high, medium or low relative to other process options of the same technology type.

Based on the above evaluation, the technologies and process options that passed the screening phase (see Section 6.0) were retained through the evaluation phase. All of the remaining technologies and process options were considered effective and implementable and had relatively comparable costs.

7. DEVELOPMENT AND ANALYSIS OF ALTERNATIVES

Screening and evaluation of potentially applicable technologies and process options were addressed in Section 6.0 (Phase I FS). Based on the remedial technologies and process options that have passed this initial screening process, Section 7.0 addresses the development and analysis of alternatives and the identification of the most feasible comprehensive remedial alternatives for AOC 6.

7.1 Development of Alternatives

The remedial alternatives presented in this section include alternatives that exceed, achieve, or do not achieve appropriate levels of remediation, as defined by the remedial action objectives (see Section 4.0). Table 7-1 includes remedial alternatives for AOC 6. These alternatives are based on the applicable technologies presented in Section 6.3.1. Each of the four (4) alternatives presented on Table 7-1 are described below.

Alternative 1: No Action

The No Action alternative for groundwater associated with AOC 6 would involve leaving the Site in its present condition. Analytes in the groundwater would remain on-Site. The no action alternative is presented here as required by USEPA and NYSDEC, and as a baseline against which to evaluate other alternatives.

Alternative 2: Limited Action

The Limited Action alternative would include future monitoring of groundwater associated with AOC 6 and institutional and engineering controls restricting access or use of the area near AOC 6 and the contaminated groundwater identified during the RFI. This alternative would include deed and access restrictions along with continued site security.

Alternative 3: In-Situ Bioremediation

ISB involves the injection of a treatment compound into the subsurface soils throughout the area of elevated chlorinated solvent concentrations within the groundwater. The amount of treatment compound to be applied and the number and location of injection wells necessary for effective treatment are estimated based upon contaminant levels and soil conditions. This alternative would also include periodic groundwater monitoring to assess the effectiveness of the remedy over time. Once the remedy has reached its effective life, deed and access restrictions may be needed along with Site security.

This alternative has been deemed applicable for AOC 6 due to the chlorinated VOC concentrations within the groundwater and subsurface conditions at AOC 6. Site-specific bench- and pilot-scale test and/or modeling to implement this technology would not be

cost-effective or necessary, as this ISB technology has repeatedly been proven effective in reducing chlorinated solvent concentrations in groundwater. The soil conditions at the Site and the high groundwater table are suitable for this technology.

Alternative 4: Pump and Treat

Pump and Treat technology involves the installation of a permanent extraction well and a treatment unit near the area of concern at the Site. Contaminated groundwater is removed from the subsurface and processed through the treatment unit to remove VOCs within the groundwater. Based on the contaminant levels, soil conditions and the impacted area, filtration followed by carbon adsorption appears to be the most feasible approach.

This alternative has been deemed applicable for AOC 6 due to the contaminant concentrations within the groundwater and subsurface conditions at AOC 6. Site-specific bench- and pilot-scale test and/or modeling to implement this technology would not be cost-effective or necessary, as this technology has repeatedly been proven effective in reducing chlorinated solvent concentrations in groundwater.

7.2 Screening of Alternatives

In this section, remedial alternatives discussed in Section 7.1 for AOC 6 are screened on the basis of effectiveness and implementability. The objective of the screening is to narrow the list of potential remedial alternatives.

Alternative 1: No Action

The No Action alternative has been retained for AOC 6 to provide a baseline condition against which other alternatives can be compared. As the title states, this alternative involves no remedial action and would leave the Site in its present condition. The no action alternative does not meet the remedial action objectives for AOC 6. There is the potential for exposure to contaminants for future contractors via incidental ingestion, dermal exposure and inhalation of VOCs as a result of vapor releases during any intrusive activities conducted at AOC 6.

Effectiveness

The No Action alternative is not considered effective because environmental risks would not be alleviated by this alternative. The magnitude of risks would remain the same and any reduction in risk would be solely due to natural attenuation. There is the potential for exposure to contaminants for future contractors via incidental ingestion, dermal exposure and inhalation of VOCs as a result of vapor releases during any intrusive activities conducted at AOC 6.

Implementability

There would be no technical difficulty associated with the implementation of this alternative.

Alternative 2: Limited Action

The Limited Action alternative would include groundwater monitoring of select existing wells, institutional controls (i.e., land and groundwater use restrictions, subsurface disturbance restrictions) and engineering controls (i.e., monitoring and maintenance). This alternative meets two (2) of the three (3) RAOs: 1) limit the incidental ingestion of groundwater containing concentrations which exceed SCGs; and 2) limit dermal/skin contact with containing analyte concentrations which exceed SCGs. It currently does not meet the third RAO (i.e., reduce the concentration of chlorinated solvents within groundwater associated with AOC 6 to levels that do not exceed the SCGs).

Effectiveness

Limited Action is not considered effective, because it would only address RAOs 1 and 2, by limiting exposure to contaminants through institutional and engineering controls. RAO 3, reducing analytes concentrations to below the unrestricted use remedy SCGs, is not accomplished by the Limited Action alternative.

Implementability

There would be no significant technical difficulty associated with the implementation of this alternative. Land use restrictions associated with this alternative would require minor coordination activities between the Site owner, local municipalities and NYSDEC.

Alternative 3: In-Situ Bioremediation

Under this alternative, groundwater would be treated in-place through the injection of a treatment compound into the subsurface soils throughout the area of elevated chlorinated solvent concentrations within the groundwater. The technology includes enhancing the natural biodegradation process by injecting nutrients, oxygen, and cultured bacterial strains or by introduction of genetically engineered microbes.

Effectiveness

ISB techniques have been effective in reducing organic contaminants and achieving compliance with SCGs. This alternative can be effectively used to treat chlorinated solvent contamination. Alterative 3 would satisfy the RAOs.

Implementability

This alternative is implementable at the VGM Site due to the nature and limited extent of chlorinated solvent contamination. AOC 6 is accessible to injection techniques.

Alternative 4: Pump and Treat

Under this alternative, contaminated groundwater is either removed from the subsurface and processed through the treatment unit to remove VOCs within the groundwater by filtration followed by carbon adsorption.

Effectiveness

Pump and treat techniques have been effective in destroying organic contaminants, thereby eliminating their release to the environment and the possibility of direct contact

with potential receptors. This alternative can be effectively used to treat chlorinated solvent contamination and achieve the RAOs.

Implementability

This alternative is implementable at the VGM Site due to the nature and limited extent of chlorinated solvent contamination and accessibility.

7.3 Summary of Screening of Alternatives

Remedial alternatives retained for AOC 6 are based on the evaluation process, as discussed below. The alternatives which passed the CMS screening process were assembled into comprehensive remedial alternatives for AOC 6. The comprehensive remedial alternatives for AOC 6 are summarized below and are further evaluated during the Detailed Analysis of Alternatives (Section 7.4).

ALTERNATIVE 1: NO ACTION

- No remedial action; leave AOC 6 in its present condition.

ALTERNATIVE 2: LIMITED ACTION

- Institutional Actions
    - Deed Restrictions (e.g., restrict on-Site groundwater use, limit subsurface activities near AOC 6)
- Engineering Controls
    - Site Security
    - Monitoring Activities
    - Maintenance Activities (e.g., asphalt surface maintenance)
- Sample and analyze groundwater from monitoring wells near AOC 6 to assess natural attenuation

ALTERNATIVE 3: IN-SITU BIOREMEDIATION

- Construct injection well grid
- Inject bioremediation media into affected area
- Sample and analyze groundwater from associated monitoring wells to assess treatment effectiveness
- Institutional Actions
    - Environmental easement or deed restrictions (e.g., restrict on-Site groundwater use, limit subsurface activities near AOC 6)
- Prepare and implement Site Management Plan (“SMP”)

ALTERNATIVE 4: PUMP AND TREAT

- Install Extraction Well
- Mobilize/Setup/Construct on-Site treatment unit
- Extract groundwater from the affected area; process through treatment unit and return to the subsurface of the affected area or discharge to POTW
- Sample and analyze groundwater from associated monitoring wells to assess treatment effectiveness

7.4 Detailed Analysis of Alternatives

The remedial alternatives developed for AOC 6 at the Site were summarized in Section 7.3. Consistent with relevant NCP and NYSDEC Subpart 375-1 regulations, and the NYSDEC DER-10 technical guidance document, these remedial alternatives undergo a more detailed evaluation in this section. The Detailed Analysis of Alternatives (Phase III FS) includes an individual and comparative analysis of the alternatives relative to criteria described in the DER-10.

7.4.1 Criteria for Analysis of Alternatives

The remedial alternatives developed for AOC 6 represent a range of distinct management strategies, which, to varying degrees, address human health and environmental concerns associated with the Site. Although the selected alternative for AOC 6 will be further refined as necessary during the design phase, these alternatives reflect the fundamental components of the various alternative environmental management approaches being considered for the Site. These alternatives are evaluated with respect to eight (8) of the nine (9) criteria identified in 6 NYCRR Subpart 375-1.8(f) and NYSDEC DER-10 Chapter 4.2. The eight (8) criteria are summarized in the following paragraphs. Community acceptance, the remaining criteria, is not considered herein, but will be addressed in the ROD, upon receipt of comments for the CMS report.

Overall Protection of Human Health and the Environment - The evaluation of each alternative with respect to the overall protection of human health and the environment provides a summary of how the alternative reduces the risk from potential exposure pathways through removal, treatment, engineering or institutional controls. This criterion also evaluates whether alternatives pose unacceptable short-term or cross-media impacts.

Compliance with SCGs - Each alternative was evaluated based on the goal of meeting the SCGs. The current SCGs for AOC 6 represent the "unrestricted use remedy" for the Site, and are the regulatory standard values for Class GA groundwaters identified in 6 NYCRR Part 703.5.

Long-Term Effectiveness and Permanence - Long-term effectiveness and permanence are evaluated with respect to the magnitude of residual risk and the adequacy and reliability of controls used to manage remaining contamination within groundwater (i.e., treatment

residuals) over the long-term. Alternatives that have the highest degree of long-term effectiveness and permanence are those that leave little or residual contamination at the Site, such that long-term maintenance and monitoring are unnecessary and reliance on institutional controls is limited.

Reduction of Toxicity, Mobility, or Volume Through Treatment - Evaluation of reduction of toxicity, mobility, or volume through treatment addresses the anticipated performance of the treatment technologies. Aspects of this criteria include: 1) the amount to be treated; 2) the reduction of toxicity, mobility, or volume; 3) the irreversibility of the treatment process; and 4) the type and quantity of residuals resulting from any treatment process.

Short-Term Effectiveness - Evaluation of alternatives with respect to short-term effectiveness takes into account: 1) protection of workers and the community during the remedial action; 2) environmental impacts from implementing the action; and 3) the time required to achieve the cleanup goals.

Implementability - Implementability deals with the administrative and technical feasibility of implementing the alternatives as well as the availability of necessary goods and services. This evaluation includes such items as: 1) the ability to obtain services, capacities, and equipment; 2) the ability to construct and operate components of the alternative; 3) the ability to monitor the performance and the effectiveness of the technologies; and 4) the ability to obtain the necessary approvals and permits from other agencies.

Cost-Effectiveness - Costs are divided into capital and O&M costs. Capital costs include those expenditures required to implement a remedial action (i.e., both direct and indirect costs are considered). Direct capital costs include construction costs or expenditures for equipment, labor, and materials required to implementing a remedial action. Indirect capital costs include those associated with engineering, permitting, construction management, and other services necessary to carry-out a remedial action.

O&M costs include costs incurred even after the initial remedial activity is complete. Annual O&M costs include labor, maintenance, materials, energy, and purchased services. The 2013 present worth costs are estimated using a 2 percent discount per year for a five (5) year time period associated with implementation of the specific alternative.
The cost estimates presented herein are order-of-magnitude estimates. These costs are based on vendor information, conventional cost estimating guides, generic unit costs and/or prior experience. The CMS cost estimates have been prepared for guidance in project evaluation from the information available at the time of the estimate. The real costs of the project at the time of implementation will depend on real labor and material costs, site conditions, competitive market conditions, final project scope, the implementation schedule, and other variable factors both anticipated and unforeseen. An uncertainty that would affect the cost is the actual length of time that contaminated groundwater would require treatment and associated monitoring to meet the unrestricted use remedy. The accuracy of these "study estimate" costs are expected to be in the range

of +50 percent to -30 percent based on anticipated Site conditions and other variables as mentioned above.

Land Use – An evaluation of the current and reasonably anticipated future use of the Site and its surroundings, as it relates to the alternative or remedy, if unrestricted land use remedies would not be achieved.

7.4.2 Analysis of Alternatives

Alternative 1 – No Action

The No Action alternative is included in this CMS to measure the potential environmental risks posed by the Site if no remedial actions were to be implemented. Contaminated groundwater would remain on-Site.

- Overall Protection of Human Health and the Environment - Since no remedial actions would be conducted as part of this alternative, any risk to human health and the environment from future potential exposure pathways would not be reduced, except through natural degradation of the analytes.
- Compliance with SCGs - This alternative would not meet the current unrestricted use remedy SCGs since specific groundwater analyte concentrations are above class GA standards.
- Long-Term Effectiveness and Permanence - The selection of this alternative would not result in a long-term or permanent solution since the analytes would remain in place.
- Reduction of Toxicity, Mobility, or Volume Through Treatment - Since there are no activities to be performed during this alternative, the only reduction in toxicity, mobility or volume of the contamination is the naturally occurring degradation of the analytes.
- Short-Term Effectiveness - The lack of any activities conducted under this alternative eliminates any short-term risks encountered by workers on-Site.
- Implementability - Since there are no activities which will be performed under this alternative, it is considered to be the most implementable.
- Costs – There would be no costs associated with this alternative because no remedial technologies would be implemented.
- Land Use – Current land use would be unaffected by this alternative, as the Site functions as commercial/industrial property and does not utilize the underlying groundwater.

Alternative 2 – Limited Action

Actions under this alternative would include land use restrictions, fence maintenance, asphalt and concrete maintenance near AOC 6, subsurface disturbance limitations, and periodic groundwater monitoring of the level of contaminants in existing monitoring wells.

Specifically, the Site would have deed restrictions to prevent below ground surface use of the property. The deed restrictions would not allow the property to be used for residential, recreational or agricultural purposes and would prohibit installation of any groundwater supply wells for drinking water purposes. This approach would limit future exposure to groundwater containing the analytes of concern. Groundwater monitoring of indicator parameters within the existing monitoring wells would be done periodically to verify that none of the analytes are migrating off-Site.

The current Site conditions and the Site control structures will be maintained through periodic inspections of the Site. Routine activities such as lawn mowing fence/gate repair and asphalt concrete surface maintenance will also be conducted.

- Overall Protection of Human Health and the Environment - Remedial actions would be limited to institutional and engineering controls to address the contamination and potential risks to human health and the environment from potential exposure pathways would be eliminated. In addition, contamination source reduction may occur through natural degradation of analytes.
- Compliance with SCGs - This alternative would not initially meet the current unrestricted use remedy SCGs since specific groundwater analyte concentrations may remain above class GA groundwater standards.
- Long-Term Effectiveness and Permanence - This alternative includes controls for any potential exposures and O&M management measures.
- Reduction of Toxicity, Mobility, or Volume Through Treatment -The institutional and engineering controls associated with this alternative would not result in the reduction in toxicity, mobility or volume of the contamination. Any reduction in toxicity, mobility or volume would result from naturally occurring degradation of the analytes.
- Short-Term Effectiveness - The implementation of the institutional and engineering controls identified in this alternative would not create any short-term risks encountered by workers on-Site.
- Implementability - The implementation of the institutional and engineering controls identified in this alternative would be reasonably achievable. The development of deed restrictions preventing groundwater use and subsurface disturbance restrictions, and the engineering controls requiring asphalt/concrete surface maintenance, security fence maintenance and installation and periodic monitoring of groundwater monitoring wells would be the key elements to implement this alternative.
- Costs - The operation and maintenance costs and capital costs are summarized on Table 7-2.
- Land Use - Current land use would be unaffected by this alternative, as the Site functions as commercial/industrial property, and does not utilize the underlying groundwater.

Alternative 3 – In-Situ Bioremediation

This alternative consists of treating the contaminated groundwater associated with AOC 6 by in-ground biological treatment. The specifications and the sequence of work required to implement this alternative are described below.

The ISB technology proposed for this application is specifically designed to enhance anaerobic bioremediation of chlorinated solvents. This process is implemented by advancing direct push drilling rods into the subsurface at the area requiring treatment to a target depth (approximately 16'), and injecting the treatment solution through the rods, under pressure, as they are withdrawn.

The overall dimension of the areal extent of treatment is thirty feet by thirty feet (30' x 30'), equating to 900 square feet. The injection point spacing is ten feet (10') on center within rows, fifteen feet (15') on center between rows. Six (6) injection points would be required to treat the 900 square-foot area. A ten feet (10') vertical treatment thickness would be achieved by beginning injection at a sixteen foot (16') depth, continuing up to a six foot (6') depth as the injection rods are withdrawn. The radius of treatment influence is a Site-specific design parameter, dependent on the type of soils and soil profile. The soils within AOC 6 are relatively porous (i.e., predominantly sand, silt and gravel). The remedial design of this alternative has factored in on-Site soil conditions to establish the areal and subsurface specifications.

A somewhat steep overburden groundwater flow was observed at the northern portion of the Site during the 2012 Supplemental RFI field effort, from north to south. This gradient appears more level beneath the parking area and the Main Building, with a moderate gradient to the southeast. Near AOC 6, there is a moderate gradient from east to west.

Following completion of the ISB program, Institutional Controls (e.g., restriction of on-Site groundwater use, limitation of subsurface activities near AOC 6, etc.) may be needed based on the levels or residual analytes in soil and groundwater near AOC 6. The type of Institutional Controls, if needed, would be assessed based on the post-ISB concentrations and the extent of the area potentially containing residual analytes. A SMP would be prepared and implemented to address any long term monitoring or maintenance that may be needed, following implementation of Alternative 3.

The organic compounds associated with AOC 6 have been successfully removed at other similar sites using this process. The technology has a latent benefit of enhancing the natural biodegradation process by leaving residual nutrients, (i.e., nitrogen and oxygen), and cultured bacterial strains to treat any residual contaminants on a long-term basis.

- Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by treating the contaminated groundwater associated with AOC 6.
- Compliance with SCGs - The treatment of the chlorinated VOCs in the groundwater near AOC 6 should result in meeting applicable SCGs.

- Long-Term Effectiveness and Permanence - Alternative 3 destroys the chemical bonds of the contaminants in place. Treating the groundwater in place limits potential exposure concerns associated with on-Site workers. Confirmatory sampling is used to assess the completion of the remedial program. Thus, this alternative is expected to achieve permanent results over the long-term.
- Reduction of Toxicity, Mobility, or Volume Through Treatment - ISB is expected to achieve a permanent and significant reduction in the toxicity, mobility and volume of contaminants in groundwater at AOC 6.
- Short-Term Effectiveness - This alternative has high short-term effectiveness due to the groundwater being directly treated on-Site. ISB is not expected to have significant potential for system failures and upon completion of treatment, is expected to be permanent. Considering the stratigraphy and contaminant levels within AOC 6 groundwater, and based on past case studies, the in-situ program may take 2 years to meet the cleanup objectives.
- Implementability - This alternative is implementable. The period of groundwater monitoring to assess the efficacy of the remedial effort is estimated to be 2 years of quarterly monitoring as part of a total 5-year semi-annual monitoring program for the purpose of this CMS. Contaminant removal rates will likely begin at a relatively high rate at the inception of the program. After a period of time, the removal rates should diminish and remain constant, indicating the completion of the ISB program. The final contaminant concentrations in groundwater will be evaluated once asymptotic (i.e., as defined in Section 4) conditions have been achieved.
- Costs - The present worth cost of Alternative 3 is presented on Table 7-3. Note that, for the purpose of preparing present worth costs in accordance with NYSDEC's requirement for a 5-year remedial time frame, the costs on Table 7-3 are based on an initial 2 years of quarterly monitoring of ISB-related groundwater quality parameters near AOC 6, and 5 years of semi-annual monitoring of the four (4) existing monitoring wells that are currently part of the semi-annual monitoring program. Also, note that the monitoring period for both of these programs may be shortened based on the effectiveness of the ISB process to treat the existing chlorinated compounds.
- Land Use - Current land use would be unaffected by this alternative, as the Site functions as commercial/industrial property and does not utilize the underlying groundwater.

Alternative 4– Pump and Treat

This alternative consists of extracting the contaminated groundwater associated with AOC 6 and treating it using an on-Site treatment system. The specifications and the sequence of work required to implement this alternative are described below.

The groundwater pump and treat alternative would be comprised of a skid-mounted carbon adsorption system. Initially, a 6 inch diameter PVC extraction well would be installed outside near MW-5A/AR. The skip-mounted system would be installed within the building and include an extraction pump with flow control and piping to facilitate quick change-out of the carbon canisters. The system would include a filter followed by two (2) 55-gallon virgin carbon drums in series (i.e., one for removal and one for polishing). Based on the present chlorinated solvent concentrations in groundwater, it is estimated that four (4) drum replacements will occur per year.

The treated effluent from the system will be discharge to the local sanitary sewer (i.e., POTW). It is anticipated that monthly monitoring of the effluent will be required along with a temporary POTW permit.

- Overall Protection of Human Health and the Environment - This alternative would protect human health and the environment by treating the contaminated groundwater associated with AOC 6.
- Compliance with SCGs - The treatment of the chlorinated VOCs in the groundwater at the Site should result in meeting applicable SCGs.
- Long-Term Effectiveness and Permanence - Alternative 4 removes the organic contaminants from the groundwater. Treating the groundwater via an external treatment unit poses limited risk for potential exposure concerns associated with on-Site workers. Confirmatory sampling is used to assess the completion of the remedial program. Thus, this alternative is considered to achieve permanent results over the long-term.
- Reduction of Toxicity, Mobility, or Volume Through Treatment – Pump and treat remedial technology is considered to achieve a permanent and significant reduction in the toxicity, mobility and volume of contaminants in groundwater at AOC 6. The carbon is typically incinerated off-site and the contaminants addressed through treatment.
- Short-Term Effectiveness - This alternative has high short-term effectiveness due to the groundwater being directly treated on-Site. This proposed method of treatment is not considered to have significant potential for system failures and upon completion of treatment, is expected to be permanent.
- Implementability - This alternative is implementable. The period of groundwater monitoring to assess the efficacy of the remedial effort is estimated to be five (5) years for the purpose of this evaluation. Contaminant removal rates would begin at a relatively high rate at the inception of the program. After a period of time, the removal rates would diminish and remain constant, indicating the completion

of the treatment process. The final contaminant concentrations in groundwater will be evaluated once asymptotic (i.e., as defined in Section 4) conditions have been achieved.

- Costs - The present worth cost of Alternative 4 is presented on Table 7-4. Note that for the purpose of preparing present worth costs in accordance with NYSDEC's requirement for a 5-year remedial time frame, the costs on Table 7-3 are based on 5 years of semi-annual monitoring of the four (4) existing monitoring wells that are currently part of the semi-annual monitoring program. Note that the monitoring period may be shortened based on the effectiveness of alternative 4 to treat the existing chlorinated compounds. Note that the costs to monitor the pump and treat system and to comply with POTW discharge requirements has been estimated based on weekly sampling and testing of the influent and effluent of the system for a 5 year period.
- Land Use - Current land use would be unaffected by this alternative, as the Site functions as commercial/industrial property, and does not utilize the underlying groundwater.

7.4.3 Comparative Analysis of Alternatives for AOC 6

For the purpose of the CMS remedial action objectives, only Alternatives 2, 3 and 4 were compared. A comparative analysis of the alternatives discussed above was completed, in general accordance with 6 NYCRR Subpart 375-1.8 and DER-10, Section 4.2 For AOC 6, Alternative 1 – No Action and Alternative 2 – Limited Action did not satisfy the eight evaluation criteria. Alternative 3 satisfies the eight criteria, but exceeds the Limited Action alternative in costs. Alternative 4 satisfies the eight criteria, but is the costliest to implement.

Alternative 2 meets six of the eight criteria. It does not meet all RAOs, nor would it actively reduce the toxicity, mobility or volume of contaminated groundwater associated with AOC 6. Any reduction in mobility, toxicity or volume would occur as a result of natural attenuation of analytes over time. Of the three alternatives considered, it costs the least.

Alternatives 3 and 4 compared similarly to one another for six of the eight criteria. These alternatives would be designed to achieve compliance with applicable SCGs and significantly reduce toxicity, mobility or volume through treatment. They would also provide for protection of human health and the environment and would provide comparable degrees of short-term and long-term effectiveness. Alternative 3 is easier to implement than Alternative 4, and has lower maintenance costs than those associated with Alternative 4. Alternative 4 will require daily monitoring of the system and frequent testing of the effluent.

Tables 7-2 through 7-4 include cost estimates for the alternatives considered, reflecting both capital and O&M costs over 5 years. Thus, Alternative 3 was the lowest cost alternative that achieved compliance with the seven criteria and is considered to be the most cost-effective. Section 8.0 identifies the results of this Detailed and Comparative Analysis of Alternatives and presents the recommended alternative, with rationales for selection.

8. IDENTIFICATION AND RECOMMENDATION OF ALTERNATIVE

Based upon the evaluation of the eight criteria with respect to each of the comprehensive remedial alternatives discussed in Section 7.0, the following alternative is recommended for the AOC 6. The estimated cost for the selected alternative is presented in Table 7-3.

Figure 2 includes a diagram of AOC 6 along with a conceptual diagram of the proposed ISB system. Alternative 3, In Situ Bioremediation, is recommended for AOC 6 for the following reasons:

- This alternative satisfies the requirements for protection of human health and the environment and should have the effect of satisfying the applicable SCGs;
- No soil is disrupted as a result of the remedial action thereby limiting the effects of the remediation upon worker health and the surrounding community. With this alternative, there would be a temporary operational impact from installing the well array system above grade. Laterals and piping may need to be placed below ground or protected above ground, resulting in some minor Site disruption;
- The cost of implementing Alternative 3 is less than the costs associated with implementing Alternative 4; and
- Alternative 3 is easier to implement than Alternative 4.

Alternative 3 satisfies all of the remedial action objectives in a cost-effective manner in comparison with the other alternatives evaluated in the Detailed Analysis Phase. Media requiring remediation are addressed and exposure and migration pathways are eliminated or controlled. Periodic groundwater monitoring will be required during the ISB treatment period to evaluate the progress of the ISB program.

The ISB process has proven successful at numerous sites for the treatment of organic contaminants in soil. The potentially moderately permeable soils near AOC 6 will not prevent ISB from reducing contaminant levels; however, it may extend the time period to achieve the cleanup objectives. In the unlikely event that this process is ineffective, the other alternatives considered for AOC 6 will be re-evaluated and an alternative selected.

9. LIMITATIONS AND USE OF REPORT

This CMS Report was prepared by Leader in accordance with 6 NYCRR Subpart 375-1, General Remediation Program Requirements and NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation. The analyses and conclusions submitted in this report are based upon data and information provided by others, and is contingent upon their validity. Cost and volume estimates included herein should be considered approximate.

This CMS Report was prepared exclusively for Stora Enso AB Company, Inc., in care of Damon Morey LLP, for specific application to the former Vails Gate Manufacturing, LLC, facility located at 1073 Route 94, Vails Gate, New York. The CMS was prepared in accordance with generally accepted engineering practice. No other warranty, expressed or implied, is made.

10. REFERENCES

The following references were used to develop this CMS Report for the former Vails Gate Manufacturing, LLC Site:

1. Clough Harbor & Associates, Inc., RCRA Facility Investigation Report, December 12, 2007.
2. Leader, Phase II Supplemental RCRA Facility Investigation, March 2012.
3. NYSDEC Division of Environmental Remediation, Letter Transmittal from Mr. John B. Miller to Mr. John Kolaga Esq., Damon Morey, LLP, Phase II Supplemental RCRA Facility Investigations Tarkett (Former Vails Gate Manufacturing) Site No. (336065), Vails Gate (T), Orange County. May 25, 2012.
4. NYSDEC Subpart 375-1: General Remedial Program Requirements. December 14, 2006.
5. NYSDEC Program Policy, Division of Environmental Remediation, Technical Guidance for Site Investigation and Remediation (DER-10). June 18, 2010.
6. U.S. Environmental Protection Agency, Mobile Treatment Technologies for Superfund Wastes, Office of Solid Waste and Emergency Response and Office of Emergency & Remedial Response, Washington, D.C., EPA 540/2 86/003(f), 1986.
7. U.S. Environmental Protection Agency, Systems to Accelerate In Situ Stabilization of Waste Deposits, Hazardous Waste Engineering Research Laboratory, EPA 540/2 86/002, 1986.
8. U.S. Environmental Protection Agency, Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Office of Emergency and Remedial Response, Office of Solid Waste and Emergency Response, Washington, D.C., EPA/540/G 89/004, October 1988

TABLES

TABLE 5-1

CORRECTIVE MEASURES STUDY
VAILS GATE MANUFACTURING, LLC
VAILS GATE, NEW YORK

SUMMARY OF GENERAL REMEDIAL RESPONSE ACTIONS

MEDIA	POTENTIAL EXPOSURE PATHWAY	GENERAL RESPONSE ACTION
Groundwater	Migration of Contaminated Groundwater	No Action Institutional Controls Groundwater Treatment

TABLE 6-1

CORRECTIVE MEASURES STUDY
VAILS GATE MANUFACTURING, LLC
VAILS GATE, NEW YORK

SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

GENERAL RESPONSE ACTION	APPLICABLE REMEDIAL TECHNOLOGY	PROCESS OPTIONS
No Action	None	None
Institutional Controls	Access Restrictions	Deed Restrictions Environmental Easements Site Security
On-Site Treatment	In-Situ Treatment	Bioremediation
	Pump and Treat	Filtration/Carbon Adsorption

TABLE 6-2

CORRECTIVE MEASURES STUDY
VAILS GATE MANUFACTURING, LLC
VAILS GATE, NEW YORK

SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING COMMMENTS
No Action	None	Not Applicable	No Action	Required for consideration by NCP and NYSDEC
Institutional Actions	Access Restrictions	Environmental Easement/Deed Restrictions/Site Security	Deeds for property in the area of influence would include supply well restrictions and precautions for future subsurface activities	Potentially Applicable
On-Site Treatment	In-Situ Treatment	Bioremediation	Treating zones of contamination by microbial degradation	Potentially Applicable
	Pump and Treat	Filtration and Carbon Adsorption	Extracting groundwater from AOC 6 and treating it through an on-Site treatment system	Potentially Applicable

TABLE 7-1

CORRECTIVE MEASURES STUDY
VAILS GATE MANUFACTURING, LLC
VAILS GATE, NEW YORK

REMEDIAL ALTERNATIVE SUMMARY

REMEDIAL ALTERNATIVE	DESCRIPTION
Alternative 1 - No Action	No Action
Alternative 2 - Limited Action	Access Restrictions, Deed Restrictions Monitoring and Maintenance
Alternative 3 – In-Situ Bioremediation	Treatment and reduction of chlorinated solvents in groundwater through injection of reagents to enhance natural biodegradation of contaminants. Includes short and long-term monitoring of nearby monitoring wells for a five (5) year period.
Alternative 4 – Pump and Treat	Installation of an extraction well and mobilization of a skid-mounted treatment system to filter and remove contaminants from groundwater. Includes monitoring of treatment system effluent and nearby monitoring wells for a five (5) year period.

Table 7-2
ALTERNATIVE 2-LIMITED ACTION COST ESTIMATE
VAILS GATE MANUFACTURING, LLC
VAILS GATE, NEW YORK

ALTERNATIVE 2 - LIMITED ACTION							
DIRECT COSTS							
ITEM	**DESCRIPTION**	**QUANTITY**	**UNIT**	**UNIT COST**	**CAPITAL**	**YEARLY O&M**	**TOTAL[(A)]**
1	INSTITUTIONAL ACTIONS						
	Deed Restrictions (Legal Fees)	1	LS	$6,000	$6,000		$6,000
2	MONITORING						
	Semi-Annual Groundwater Monitoring (4 wells, 2 events per year for 5 years)	8	Well	$600		$4,800	$23,225
3	ON-SITE MAINTENANCE AND SECURITY	1	Year	$1,000		$1,000	$5,713
TOTAL DIRECT COSTS (TDC)					**$6,000**	**$5,800**	**$34,938**
INDIRECT COSTS							
4	CONTINGENCY - 15% OF TDC	1	LS	$5,241	$5,241		$5,241
TOTAL INDIRECT COSTS					**$5,241**	**$0**	**$5,241**
TOTAL COSTS					**$11,241**	**$5,800**	**$40,179**

NOTES:
A Includes capital cost plus present worth O&M cost for 5 years.
B Includes 2% interest rate

Table 7-3
ALTERNATIVE 3 - IN-SITU BIOREMEDIATION COST ESTIMATE
VAILS GATE MANUFACTURING, LLC
VAILS GATE, NEW YORK

ALTERNATIVE 3 - IN-SITU BIOREMEDIATION							
DIRECT COSTS							
ITEM	**DESCRIPTION**	**QUANTITY**	**UNIT**	**UNIT COST[A][C]**	**CAPITAL**	**YEARLY O&M**	**TOTAL[B]**
1	TREATMENT OF CONTAMINATED MEDIA						
	Bioremediation product	333	CY	$15	$4,995		$4,995
	Bioremediation medium application	333	CY	$15	$4,995		$4,995
2	MONITORING						
	Baseline sampling and analysis for ISB parameters	4	Well	$600	$2,400		$2,400
	Quarterly sampling and analysis for ISB parameters (4 wells 4 events per year for 2 years)	16	Well	$600		$9,600	$19,239
	Semi-Annual groundwater monitoring (4 wells, 2 events per year for 5 years)	8	Well	$600		$4,800	$23,225
3	ON-SITE MAINTENANCE AND SECURITY	5	Year	$1,000		$1,000	$5,713
TOTAL DIRECT COSTS (TDC)					**$12,390**	**$10,600**	**$60,567**
INDIRECT COSTS							
4	Engineering and Oversight	1	LS	$4,000	$4,000		$4,000
5	Contingency - 15% of TDC	1	LS	$9,085	$9,085		$9,085
6	Health and Safety Monitoring	1	LS	$500	$500		$500
7	Legal Fees	1	LS	$1,000	$1,000		$1,000
8	Req'd. License, Deed or Permit	1	LS	$0	$0		$0
9	Mobilization/Demobilization	1	LS	$500	$500		$500
TOTAL INDIRECT COSTS					**$15,085**	**$0**	**$15,085**
TOTAL COSTS					**$27,475**	**$10,600**	**$75,652**

NOTES:

A Unit costs include labor and equipment unit rates at level D protection.
B Includes capital cost plus present worth O&M cost for 5 years, except whe
C In-Situ unit costs include installation and construction of the injection well grid.
D Includes 2% interest rate

Table 7-4
ESTIMATE OF COSTS
ALTERNATIVE 4 - PUMP AND TREAT COST ESTIMATE
VAILS GATE, NEW YORK

ALTERNATIVE 4 - PUMP AND TREAT							
DIRECT COSTS							
ITEM	**DESCRIPTION**	**QUANTITY**	**UNIT**	**UNIT COST[A][C]**	**CAPITAL**	**YEARLY O&M**	**TOTAL[B]**
1	TREATMENT OF CONTAMINATED MEDIA						
	Pump and Treatment System Installation	1	System	$10,000	$10,000		$10,000
	Pump and Treatment System Monitoring (influent and effluent, 52 events per year for 5 years)	52	Weeks	$300		$15,600	$73,830
	Pump and Treatment System Carbon	4	Drums	$1,000		$4,000	$19,854
	Extraction Well Construction	1	Well	$5,000	$5,000		$5,000
2	MONITORING						
	Semi-Annual Groundwater Monitoring (4 wells, 2 events per year for 5 years)	8	Well	$600		$4,800	$23,225
3	ON-SITE MAINTENANCE AND SECURITY	5	Year	$1,000		$1,000	$5,713
TOTAL DIRECT COSTS (TDC)					**$0**	**$25,400**	**$137,622**
INDIRECT COSTS							
4	Engineering and Oversight	1	LS	$4,000	$4,000		$4,000
5	Contingency - 15% of TDC	1	LS	$20,643	$20,643		$20,643
6	Health and Safety Monitoring	1	LS	$500	$500		$500
7	Legal Fees	1	LS	$3,000	$3,000		$3,000
8	Req'd. License, Deed or Permit	1	LS	$2,000	$2,000		$2,000
9	Mobilization/demobilization	1	LS	$500	$500		$500
TOTAL INDIRECT COSTS					**$30,643**	**$0**	**$30,643**
TOTAL COSTS					**$30,643**	**$25,400**	**$168,265**

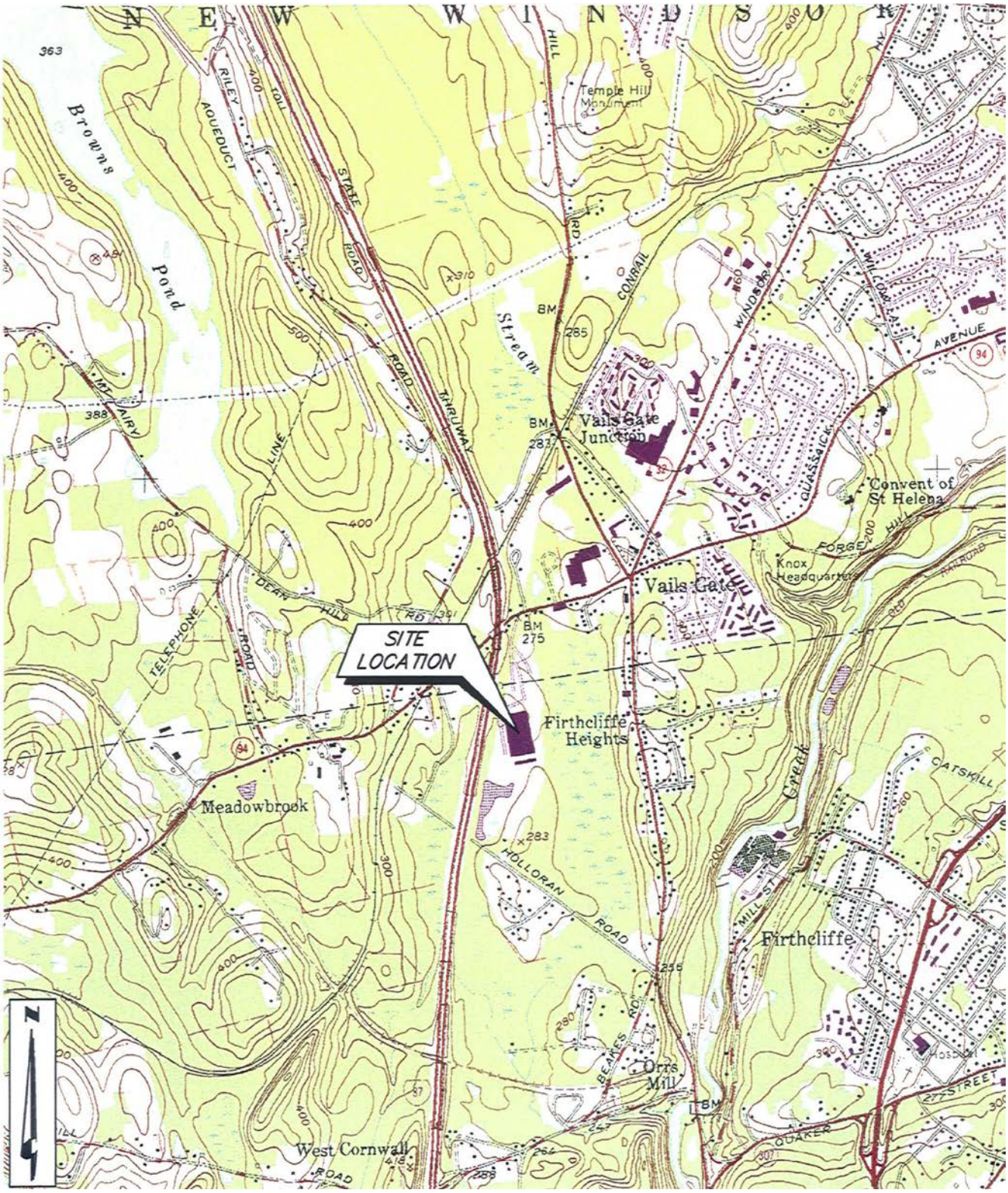
NOTES:

A Unit costs include labor and equipment unit rates at level D protection.

B Includes capital cost plus present worth O&M cost for 5 years.

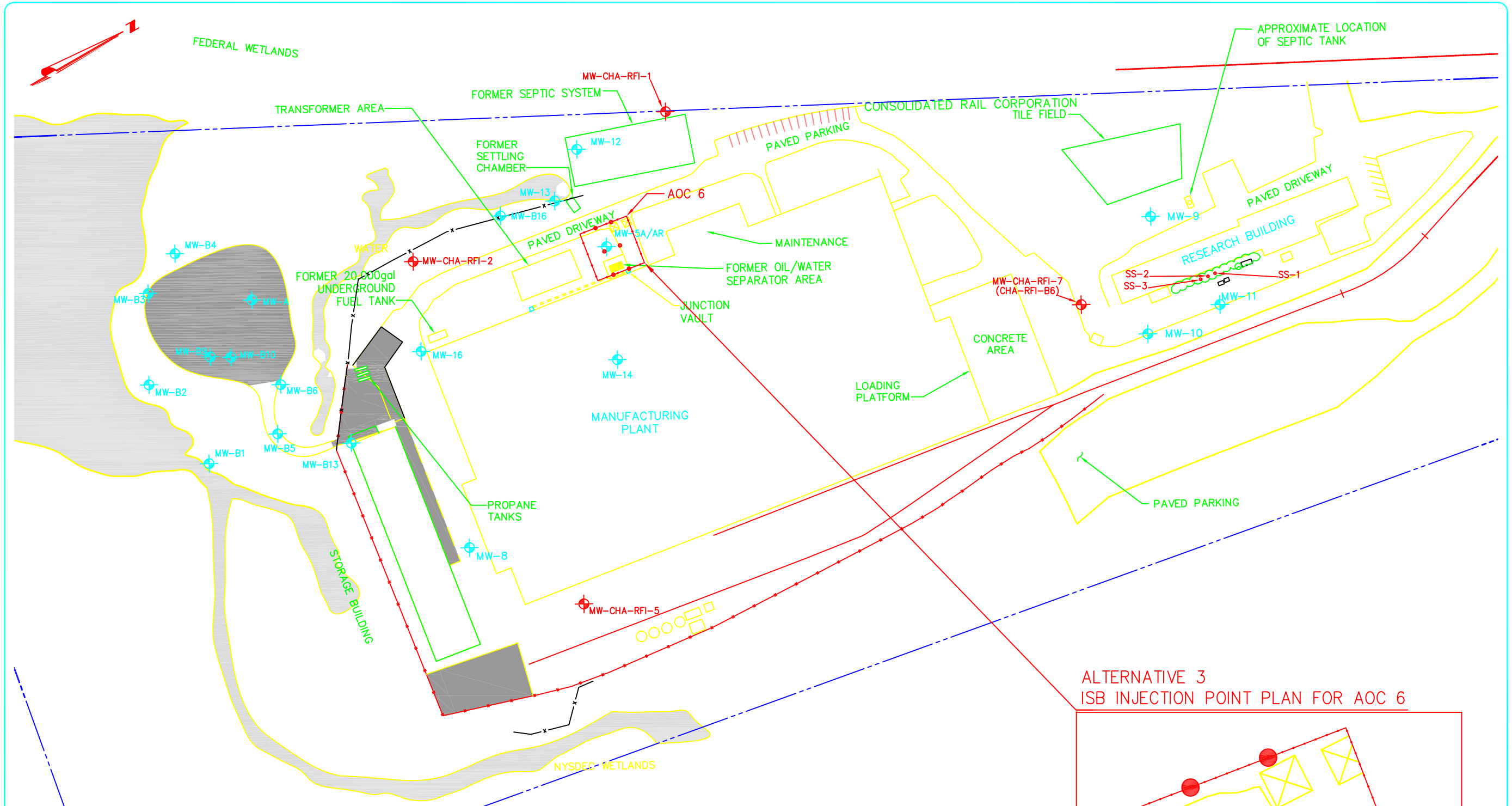
C Includes 2% interest rate

FIGURES



SOURCE: CHA March 10, 2011 RCRA Facility Investigation – Vapor Intrusion Investigation.

Title: Site Location Map 1073 Route 94, Vails Gate, New York	LEADER Leader Professional Services, Inc. 2813 Wehrle Drive, Suite 1 Williamsville, New York 14221 (716) 565-0963 (716) 565-0964 (fax)	Project: 737.002 Date: 12/2012 Scale: N.T.S.	Drawn: HDK Checked: JAW File Name:	Figure: 1
Prepared For: Damon Morey LLP				



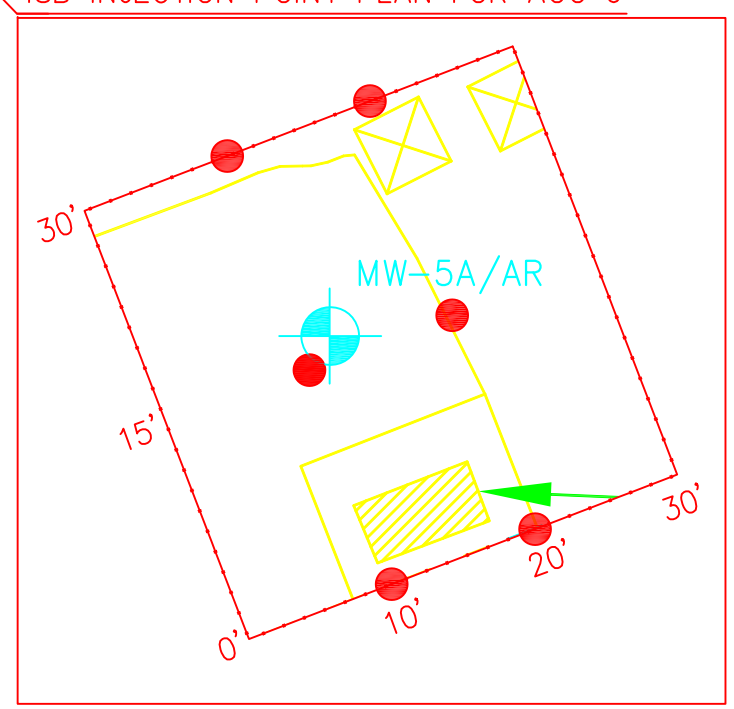
LEGEND

- Phase II RFI 2011 Monitoring Well Installation
- Existing Monitoring Well
- Injection Point

NOTES

1) Base map prepared by CHA
2) Phase II RFI test boring/monitoring well and sampling locations located by Leader based on standard surveying techniques.
3) Drawing considered accurate to the degree implied by the method used.

ALTERNATIVE 3
ISB INJECTION POINT PLAN FOR AOC 6



No.	Submittal / Revision	Appr'd	By	Date
1	Phase II RFI	KK	HK	9/2011
2	Corrective Measures Study	KK	HK	12/2012

THE LEADER GROUP
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Designed By: CHA	Date: 01/12/06	
Drawn By: CHA	Date: 01/10/06	
Revised by: The Leader Group	Date: 12/1/12	

VAILS GATE
MANUFACTURING FACILITY
VAILS GATE, NEW YORK

CORRECTIVE MEASURES STUDY

SITE PLAN

Issue Date: 12/5/12 | Project No.: 737.002 | Scale: NTS

Figure No.
2