REMEDIAL ACTION WORK PLAN

Lee Avenue Railroad Area
Chenango County, Norwich,
New York
DEC Site #709014

Prepared For:
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Prepared By:

August 8, 2017

REMEDIAL ACTION WORK PLAN
LEE AVENUE RAILROAD AREA, NORWICH, NY SITE #709014

DATE: AUGUST 8, 2017

REPORT CERTIFICATION:

I, Kristin A. VanLandingham, certify that I am currently a New York State registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

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8/8/2017
Date

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ACRONYMS

Ashland	Ashland LLC/Ashland Inc.
CAMP	Community Air Monitoring Plan
CCR	Construction completion report
CD	compact diskette
CERP	Community and Environmental Response Plan
CFR	Code of Federal Regulations
CP	Commissioner's Policy
CY	cubic yard
DEC	New York State Department of Environmental Conservation
DER	Division of Environmental Remediation
DO	dissolved oxygen
DOH	New York State Department of Health
EHS Support	EHS Support LLC
FER	Final Engineering Report
FS	Feasibility Study
HASP	Health and Safety Plan
Hercules	Hercules LLC / Hercules Incorporated
HRO	High Retention Oil
HWDS	Hazardous Waste Disposal Site
IDW	Investigative Derived Waste
IEC	Institutional Control and Engineering Control
IRM	Interim Remedial Measure
I&M	Inspection and Maintenance
NYCRR	New York Codes, Rules, and Regulations
NYS&W	New York Susquehanna and Western
NYSPE	New York State Professional Engineer
Order	Order on Consent and Administrative Settlement
ORP	oxidation reduction potential
PCBs	Polychlorinated Biphenyls
PGWSCOs	Protection of groundwater soil cleanup objectives
PVC	polyvinyl chloride
RAMP	Remedial Action Monitoring Plan
RAWP	Remedial Action Work Plan
RI	Remedial Investigation
ROD	Record of Decision
SCGs	Standards, Criteria and Guidance
SCOs	Soil Cleanup Objectives
SDC	Shaw Dechlorination Consortium
sf	square feet

Site	Lee Avenue Railroad Area
SMP	Site Management Plan
SSD	sub-slab depressurization
SVOCs	semi-volatile organic compounds
TCE	trichloroethene
TCLP	toxicity characteristic leaching parameters
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

STATEMENT OF LIMITATION

This Remedial Action Work Plan (RAWP) is intended for the sole use of Hercules LLC (Hercules), a wholly owned subsidiary of Ashland LLC (Ashland). The scope of services performed may not be appropriate to satisfy the needs of other users, and any use or re-use of this document or of the findings, conclusions, or recommendations presented herein is at the sole risk of said user. Background information and other data have been furnished to EHS Support LLC (EHS Support) by Hercules, Ashland and/or third parties, which EHS Support has used in preparing this RAWP.

Opinions presented herein apply to the existing and reasonably foreseeable site conditions at the time of our assessment. They cannot apply to site changes of which Ashland or its contractors are unaware and has not had the opportunity to review. Changes in site conditions may occur with time due to natural processes or works of man at the site or on adjacent properties. Changes in applicable standards may also occur as a result of legislation or the broadening of knowledge.

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) is being submitted to the New York State Department of Environmental Conservation (DEC) and the New York State Department of Health (DOH) [referred to within as the State] for the Class 2 Inactive Hazardous Waste Disposal Site (HWDS) #709014, known as the Lee Avenue Railroad Area (Site) in the City of Norwich, Chenango County, New York (**Figure 1-1**).

This RAWP was prepared pursuant to the Order on Consent and Administrative Settlement (Order) executed on July 10, 2012 between the DEC and Hercules (Index #R7-0787-12-06) and in accordance with the procedures outlined in the following State Standards, Criteria and Guidance (SCG) documents:

- NYSDEC Program Policy, Division of Environmental Remediation (DER), *Technical Guidance for Site Investigation and Remediation* (DER-10), issued May 3, 2010 (DEC 2010).
- NYSDEC, Commissioner's Policy (CP)-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009.
- NYSDEC, DER, *Title 6 of the Official Compilation of the New York Codes, Rules, and Regulations, Part 375, Environmental Remediation Programs* (6 New York Codes, Rules, and Regulations [NYCRR] Part 375), effective December 14, 2006 (DEC 2006).
- NYSDEC, DER, *6 NYCRR Part 700-706, Water Quality Regulations for Surface Waters and Groundwater*), effective August 4. 1999 (DEC 1999) and subsequent 2008 Express Terms for Amendments to 6 NYCRR Parts 700-704, effective February 16, 2008.

1.1 Purpose

The purpose of this RAWP is to provide a detailed description of the remedial action to be conducted for each media driving vapor intrusion risks. This includes the following:

- excavation of Site soil exceeding the protection of groundwater soil cleanup objectives (PGWSCOs) for those contaminants found in groundwater above the Class GA Groundwater standard;
- in-situ treatment of Site groundwater exceeding the Class GA Groundwater standards; and
- monitoring programs for groundwater and soil vapor.

This RAWP is meant to provide the details necessary to successfully implement remedial actions.

A discussion of the nature and extent of contamination and remedy selection parameters is provided in the DEC-approved Remedial Investigation (RI) Report dated May 12, 2014 (EHS Support 2014) and the DEC-approved Feasibility Study (FS) Report dated February 29, 2016 (EHS Support 2016), respectively. Following the public comment period earlier this year, the State issued the Record of Decision on March 31, 2017. Per Section 5.2(b)1 of the DER-10 guidance document, a copy of the Record of Decision (ROD), outlining the remedial selection, is provided as **Appendix A**.

1.2 Remedial Action Work Plan Components

Pursuant to DER-10 Section 5.3(b), this RAWP includes the components listed below:

- Detailed description of the remedial action for each media
- Description of site controls to be implemented during remedial activities
- Description of post remedial action sampling
- Preliminary design drawings
- Site restoration
- Institutional controls
- Cost estimate

- Schedule
- Requirements for Site Management Plan (SMP), Final Engineering Report (FER) and electronic submissions

Pursuant to the common elements identified in DER-10 Section 5.1(c), this RAWP includes the following documents:

- Community Air Monitoring Plan (CAMP)
- Fugitive Dust and Particulate Monitoring Plan

1.3 Remedial Action Work Plan Variances

For completeness, the following variances from DER-10 Section 5.1 are summarized below:

- Remedial actions performed under this RAWP will not require significant monitoring due to the relatively short duration of remedial action; therefore, a Remedial Action Monitoring Plan (RAMP) is not warranted. Said activities will be addressed in the CAMP.
- Remedial action activities will be performed on private properties and do not impact public access; therefore, a Community and Environmental Response Plan (CERP) is not warranted.
- Remedial actions described within this RAWP will not impact fish, wildlife, or cultural resources therefore, measures to protect these resources are not warranted.
- A formal remedial design is not required by DEC; therefore, a Remedial Design Work Plan pursuant to DEC-10 Section 5.1(b) is not provided.

1.4 Remedial Design and Interim Remedial Measures Activities

Remedial design activities, including baseline groundwater sampling, bedrock depth profiling and waste characterization sampling to support remedial action were implemented in July 2017 and are discussed in this RAWP.

Interim Remedial Measures (IRMs) for vapor intrusion include operation and maintenance of 69 sub-slab depressurization systems and annual heating season monitoring of properties within the vapor intrusion study area. Inspection, maintenance and monitoring of IRMs will be discussed in the SMP.

2.0 REMEDIAL ACTION WORK PLAN

This section provides a detailed description of the approved remedial actions to be implemented at the Site. As identified in the ROD issued on March 31, 2017, the four remedial actions (by media) include:

- Onsite Soil: Excavation and Off-site Disposal of Contaminant Source Areas
- Onsite Groundwater: In-Situ Treatment of Fractured Bedrock Groundwater
- Offsite Groundwater: Monitoring of Unconsolidated Groundwater
- Offsite Vapor: Soil Vapor Intrusion Evaluation

2.1 Excavation and Off-site Disposal of Contaminant Source Areas

Remedial action for soil includes excavation and off-site disposal of soils which exceed the PGWSCOs as defined by 6 NYCRR Part 375-6.8 for those contaminants found in groundwater above standards. Approximately 772 cubic yards (CY) of contaminated soil will be removed from the Site. A map identifying those constituents found in soil above the PGWSCOs is provided as **Figure 2-1**.

The excavation area measures approximately 15 feet wide (east-west) by 400 feet long (north-south) on the east side of the rail road right-of-way, north of Rexford Street. The proposed excavation area is provided as **Figure 2-2.** The lateral extent of excavation is based on Site property boundaries to the north, east, and south; and, a 15-foot set-back from the railroad centerline to the west. The excavation will not require disturbance of the existing rail line or signals.

2.1.1 Remedial Design Activities

During the week of July 17, 2017, a remedial design field survey was completed to support development of the RAWP, environmental easement and contractor procurement. Provided below is a summary of remedial design activities. A Site plan identifying surface features within the planned excavation area is provided as **Figure 2-3**.

2.1.1.1 Site Reconnaissance

The surface cover across the excavation area consists of a mixture of asphalt, grass and gravel. Site photographs are provided below.

Excavation Area Looking North

Excavation Area Looking South

Four (4) bedrock groundwater monitoring wells (LARW11-2, LARW11-3, MW-10R, and URS-3R) are within the planned excavation area. Based on the limited depth of excavation (average two feet), soil will be surgically removed around each monitoring well to minimize disturbance and avoid impacting well integrity. Refer to photographs below.

Monitoring Wells URS-3R and MW-10R
Looking East

Monitoring Well LARW11-3
Looking South

Trees, railroad signal panels and associated utility poles are located at the north and south end of the planned excavation area. Trees within the limits of the excavation will be removed in preparation for soil removal action. However, railroad panels and utilities are planned to remain intact. Refer to photographs below.

Railraod Signal Panel (Southend)
Looking Northeast

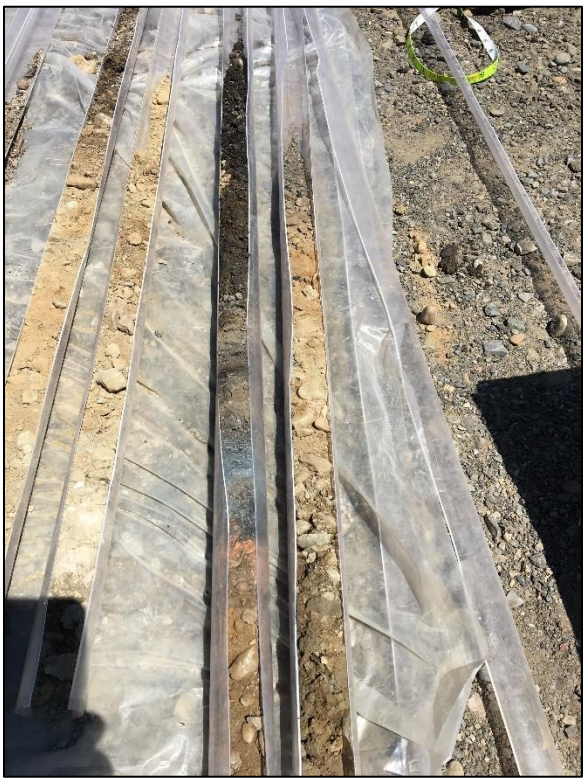
Railraod Signal Panel (Northend)
Looking Northeast

2.1.1.2 Bedrock Profiling

On July 19, 2017, nine (9) soil borings (DP1 through DP2) were completed approximately 40 feet apart within the planned excavation area to define the vertical limits of excavation (depth to bedrock). Soil borings were advanced to refusal with a truck-mounted Geoprobe 5410 using direct push technologies. The location of each boring is provided on **Figure 2-3**.

In general, soils borings were advanced between 22-28 inches below grade (refusal). A maximum depth of eight (8) feet was encountered in the southern limits of the planned excavation area (DP8 and DP9) near Rexford Street. Soil consists of loose silt and clay with gravel. Refer to photograph below (left). Material encountered near Rexford Street included fill material (i.e., glass, metal, brick fragments) overlying a thin layer of native silts/clays. Refer to photograph below (right). The source of fill material is unknown, but was likely emplaced at the time the railroad signals and control panels were installed.

Soil Cores DP1 through DP7
Left to Right



Soil Cores DP8 (left) and DP9(right)

2.1.1.3 Waste Characterization

In preparation for soil disposal, soil samples were collected in laboratory supplied glassware, packaged on ice and shipped under chain of custody to TestAmerica Buffalo New York for analysis of bulk density, percent moisture, and toxicity characteristic leaching parameters (TCLP) for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. The results of sampling are pending from the laboratory.

2.1.2 Site Preparation

Work will be completed under a right of entry permit with the New York Susquehanna and Western (NYS&W) Railway Corp (**Appendix B**) and access agreement with the adjacent property owner of 1-11 Lee Avenue (Atlantic Coast Buildings, LLC).

Pursuant to 16 NYCRR Part 753 (Protection of Underground Facilities), the excavation contractor will notify 811 prior to the start of remedial action activities.

Trees within the limits of the excavation will be removed in preparation for soil removal action. Waste generated during tree clearing will be transported off-site (or chipped and reused on-site).

According to representatives from the NYS&W Railway Corp, the railroad signals are planned to be returned to service in 2018; therefore, tree clearing and excavation activities will be performed to minimize the disturbance of the railroad signal panels and associated utilities. Any deviations from the soil excavation area (exclusion zones) will be noted in the FER.

Monitoring wells will be identified and marked in the field. A steel plate and/or temporary riser extension will be placed on (or around the well) during soil removal action.

Temporary Site controls including fencing and temporary facilities are discussed in **Section 2.1.5**.

2.1.3 Soil Removal Action

A pre-excavation Site survey will be completed to identify the limits of the excavation, including necessary set-backs from the railroad, Rexford Street, and adjacent site buildings. The excavation will extend vertically to top of bedrock. As noted above, the top of bedrock is approximately two feet below grade sloping to 8 feet within the southern extent of the excavation area. A cross sectional view of the excavation area is provided as **Figure 2-4.**

Excavated soil will be direct loaded and transported to an appropriate disposal facility based on the results of waste characterization. Because the excavation area is pre-defined, existing Site data will be used to document soil conditions remaining at the Site. Long term Site controls including an Environmental Easement will restrict use of the Site. Therefore, no confirmation or documentation sampling is planned to be conducted. The Environmental Easement is discussed in **Section 2.6**.

2.1.4 Backfill and Site Restoration

Fill material meeting the requirements of 6 NYCRR Part 375-6.7(d) and DER-10 Section 5.6(e) will be brought in to replace excavated soil and establish the design grades at the Site. Imported fill will be sampled in accordance with DER-10 Table 5.4(e)10. Based on the anticipated volume, six to seven grab samples will be taken from the fill material and analyzed in the laboratory setting for VOCs (8260B) and two (2) composite samples will be collected and analyzed for semi-VOCs, inorganics, PCBs, and pesticides. (Refer to **Table 2-1**). Documentation of the source of fill, bills of lading and applicable compliance sampling will be provided in the FER.

The final surface cover grade will match the existing grade conditions. Monitoring wells will be inspected and surface covers will be repaired and/or replaced during site restoration activities

2.1.5 Temporary Site Controls

A temporary construction fence will be required around the perimeter of the work area to restrict and/or limit traffic (vehicular and pedestrian) within the work area. The construction fence will be designed for "one-way" traffic flow entering/exiting from Lee Avenue and Rexford Street.

Work will be completed in accordance with the CAMP and Fugitive Dust and Particulate Monitoring Plan. The CAMP outlines minimum requirements for air monitoring including fugitive dust controls. Additional controls may be determined by the remediation contractor during excavation activities. A copy of the

CAMP and Fugitive Dust and Particulate Monitoring Plan are provided in **Appendix C-1** and **Appendix C-2**, respectively**.**

Work will be completed during normal business hours; therefore, additional Site lighting is not required.

A project specific Health and Safety Plan (HASP) will be developed by the selected remediation contractors for field activities. The HASP will outline the anticipated hazards and safety requirements to address those hazardous. The HASP will identify the personal protective equipment needed to ensure a safe work environment. The HASP will provide emergency contact information including urgent care and hospital routes.

Other than limited perched water, groundwater or saturated soils are not anticipated.

Temporary facilities to manage storm water run-off into or out of the excavation area and/or Site will be addressed through stormwater, sediment and erosion plans developed by the selected remediation contractor in compliance with local requirements.

The Site is not equipped with potable water or restrooms. The contractor will be required to provide temporary facilities (portable toilet and wash station) to ensure safe working conditions per the contractor specific health and safety plan.

The contractor will develop a plan to decontaminate heavy equipment at the Site. In addition, efforts will be taken minimize and/or remove access soil/mud from equipment and trucks tires before leaving the work area.

2.2 In-Situ Treatment of Fractured Bedrock Groundwater

Remedial action for groundwater within the fractured bedrock includes in-situ treatment using commercially available in-situ treatment technologies to supplement the ongoing natural degradation of contaminants in groundwater. A map identifying those constituents found in above the Class GA Groundwater standards in fractured bedrock is provided as **Figure 2-5**. The proposed treatment area is provided as **Figure 2-6.**

2.2.1 Remedial Design Activities

Provided below is a summary of remedial design activities completed to support remedial action for groundwater.

2.2.1.1 Well Integrity Inspection

During the week of July 17, 2017, monitoring well integrity inspections were completed on the 42 monitoring wells in the network to verify the integrity. A monitoring well location map is provided on **Figure 2-7**. Each monitoring well was successfully identified in the field. A headspace reading, depth to water and total depth measurements were recorded. Overall, monitoring wells were identified in good condition, with the exception of monitoring well MW-22 manhole coverlocated immediately north of Borden Avenue. Corrective action to replace the manhole cover and well pad will be scheduled. Total depth measurements were compared to installation depth. \A summary of monitoring well construction details is provided as **Table 2-2**.

2.2.1.2 Baseline Sampling Event

A baseline groundwater sampling event was completed between July 24 through July 31, 2017. Groundwater samples were collected from each monitoring well in accordance with the previously-approved remedial investigation work plan using United States Environmental Protection Agency (USEPA) low flow purging and sampling procedures. Water quality parameters including pH, conductivity, temperature, dissolved oxygen (DO), oxidation reduction potential (ORP), and turbidity were recorded until stabilization. Monitoring wells constructed with a one-inch diameter (or less) well casing were sampled using three volume purge and sampling methodologies using disposable polyethylene bailers or peristaltic pump. Groundwater samples were collected in laboratory supplied glassware, placed on ice and shipped under chain of custody to TestAmerica Buffalo New York for laboratory analysis of VOCs using USEPA method 8260C. A subset of monitoring wells within, upgradient and downgradient of the treatment area were additionally analyzed for geochemical and microbial analytes. A summary of the groundwater sampling program is provided on **Table 2-3**.

The water quality and analytical results will be used to document conditions prior to treatment (i.e., baseline conditions); and, to select wells suitable for post remediation compliance monitoring and/or abandonment.

2.2.1 Site Preparation

Work will be completed under right of entry permit with the NYS&W Railway Corp. Injection wells will be installed following completion of soil remedial action activities. Temporary Site controls for groundwater remediation are discussed in **Section 2.2.5**.

2.2.2 Injection Well Installation

Injection wells will be installed within the fractured shale bedrock for delivering the reagent to the zones of highest observed concentrations of VOCs. Each boring will be advanced using air rotary/hammer drilling method. An eight-inch diameter borehole will be created to facilitate installation of a 4-inch diameter well. Following boring termination, each well will be constructed of continuous four (4)-inch diameter schedule 40 polyvinyl chloride (PVC) 0.010-inch or 0.020-inch slotted screen. The screen will extend the entire length of the saturated zone between 5 feet to 30-40 feet deep. Appropriately sized filter pack sand will be placed around the screened interval and a minimum of two (2)-feet of bentonite grout will be placed on top of the filter sand pack and hydrated using a tremie pipe. The remainder of the borehole annulus will be tremie-grouted near grade. Injection wells will be completed with a stick-up protective casing (or suitable flushmount well vault) and concrete well pad. A cross section of the conceptualized treatment area is provided as **Figure 2-8.**

After allowing the cement grout seal to cure for at least 24 hours, the wells will be developed by surging the well with a surge block and then purging the well using a pump or bailer. The well will be surged by raising and lowering a surge block within the screened interval. The vertical motion of the surge block within the well will help to surge the filter pack and purge the entrained sediments from the well. Each 5-foot length of screen should be surged for at least 10 minutes. Approximately ten casing volumes of groundwater will then be removed from each well using the pump or bailer, assuming the well is not purged dry. If the well is purged dry, the well will be allowed to recharge and purged at least two additional times before development is considered complete. During development, periodic measurements of the water level, water volume removed, pH, conductivity, temperature, DO, ORP, and turbidity will be recorded. If wells recharge sufficiently during development, short term drawdown testing will be conducted to assess hydraulic properties of the fractured bedrock to aid in amendment delivery design.

Soil cuttings and purged groundwater will be containerized in 55-gallon steel drums and appropriately labeled in accordance with the Investigative Derived Waste (IDW) Management Plan included in **Appendix D**.

2.2.3 Zone of Influence/Capacity Testing

Remediation within fractured bedrock has uncertainties and limitations, including the variability of the fractured network within the treatment area. Therefore, it is necessary to gain a better understanding of Site-specific conditions to support the selection and dosing rate of in-situ treatment reagent.

The capacity of each well (fractured rock) to receive amendments will be initially tested by injecting potable water into each injection point. Potable water will be injected at variable rates (and depths) to identify the receiving capacity of the local formation. The radius of influence will be monitored in existing monitoring wells. The potential for daylighting will be also monitored. The results of field testing will be used to select the appropriate treatment reagent and rate of delivery best suited for site-specific conditions.

2.2.4 Bioremediation Amendment

Bioremediation amendments and chemical oxidation amendments were considered for use at the Site. Bioremediation amendments were selected because they are much longer-lasting than chemical oxidants and because bioremediation amendments have a good track record of detoxifying trichloroethene (TCE) all the way to non-toxic endpoints like ethene, ethane, methane, carbon dioxide, and chloride ion.

The following suppliers of TCE bioremediation amendments were contacted to obtain their recommendation for the best product they offer for this application:

- EOS Remediation (http://www.eosremediation.com/)
- Provectus (http://www.provectusenvironmental.com/)
- Renenesis (https://regenesis.com/)
- RNAS (http://rnasinc.com/products/newman-zone/)
- Tersus (http://www.tersusenv.com/en/)

Two of these suppliers offer bioremediation products intended specifically for application in bedrock; like that at the Site.

- EOS Remediation – EOS 100 (http://www.eosremediation.com/eos-100-product-information/)
- RNAS – Newman Zone Newman Zone High Retention Oil (HRO)™ (http://rnasinc.com/products/newman-zone-hro/)

Both of these suppliers offer the same bioremediation bacteria culture. However, Newman Zone HRO™ is selected for use at this Site because:

- RNAS offers companion biological nutrients (Newman Zone Microblend™)
- RNAS offers fast-acting dissolved oxygen scavenger (Newman Zone OS™)
- RNAS offers rental of reagent dosing/mixing/emplacement equipment

More specifically, Newman Zone HRO™ is a neat-oil blend of soybean oil used for anaerobic bioremediation of chlorinated solvents in bedrock settings. Its application allows the reagent to be emulsified in water on-site before emplacement into the subsurface. Chase water is used to further distribute the emplaced HRO in the subsurface. HRO's relatively large oil droplet size (1 to 10 µm) is preferred in fractured bedrock settings instead of small droplet sizes (<1 µm) used for application in fine sands, silt, and clay settings. Newman Zone HRO™ specification sheet is provided as **Appendix E**.

In addition to Newman Zone HRO™, a widely-used non-toxic, non-pathogenic, non-genetically modified, naturally occurring consortium of trichloroethene (TCE) degrading bacteria known as Shaw Dechlorination Consortium #9 (SDC-9) will be added to augment natural formation bacteria for the purposes of expediting onset and maintaining longevity of TCE detoxification. SDC-9 bacteria culture containing about $1x10^{11}$ *Dehalococcoides* bacteria will be split between each of the five injection wells. Information on SDC-9 bioremediation culture is included in **Appendix E**.

Bionutrients in the form of Newman Zone Microblend™ will be used. Newman Zone Microblend™ contains sterile food-grade yeast extract and vitamin B12. Information on Newman Zone Microblend™ bionutrients is included in **Appendix E**.

Oxygen scavengers like food-grade vitamin C (ascorbate) or Newman Zone OS™ (food-grade isoascorbate, iron, and carbonate) may be used. Information on Newman Zone OS™ is included in **Appendix E**.

The recommended material list for in-situ remediation at the Site includes:

- (5) 275-gallon totes of concentrated Newman Zone HRO™
- (1) 19-liter keg of bioremediation bacteria culture SDC-9™
- (5) 120-pound packages of Newman Zone Microblend™ bionutrients
- (5) 5,600-gallon doses of Newman Zone OS™ oxygen scavenger
- Mixing tank(s) for on-site emulsification
- (1) 5-channel delivery system with flow meters, flow controls, and hosing
- Potable water (10-gallon per minute minimum)

It is estimated each delivery point will receive the bioremediation reagents via gravity drain techniques. The delivery rate is delivered is dependent on the capacity of the injection wells. A water source, such as fire hydrant or truck-filled water tank, will be utilized to achieve onsite blending of Newman Zone HRO™ to achieve a 5% HRO injectate. Quantities may be adjusted after determination of the injection wells' capacity to receive aqueous liquids.

2.2.5 Temporary Site Controls

Work will be completed during normal business hours; therefore, additional Site lighting is not required. However, if application of amendment requires 24-hour oversight, Site security will be evaluated. A temporary construction fence may be required to restrict and/or limit traffic (vehicular and pedestrian) within the work area.

In accordance with 40 Code of Federal Regulations (CFR) Part 144 and NYSDEC Guidance on Injections for Remediation dated April 21, 2014, the proposed injection activity is authorized by rule and no Underground Injection Control (UIC) permit is required as long as compliance with the UIC program (i.e., notification and inventory) is completed.

All work will be completed under a Site-specific HASP.

2.2.6 Compliance Monitoring

Per the DEC-approved FS Report A five-year compliance groundwater monitoring program will be implemented to monitor the effectiveness of in-situ remediation to foster continued degradation of VOCs in the source area. Compliance monitoring will include monitoring well integrity inspections and sampling for VOCs, geochemistry, and microbial activity. A monitoring plan outlining the specific parameters, frequency, sampling locations and quality control procedures will be provided in the SMP.

2.3 Monitoring of Unconsolidated Groundwater

Following in-situ treatment of fractured bedrock groundwater, the dilute VOC-plume within the Unconsolidated Water-bearing Zone will be monitored annually for five years. This data will be used to evaluate groundwater conditions within the vapor intrusion study area. The results of sampling will be compared to historical data to document steady state and/or continued reducing concentrations overtime. A monitoring plan outlining the specific parameters, frequency, sampling locations and quality control procedures will be provided in the SMP.

2.4 Abandonment of Monitoring Wells

In preparation for Site Management, a subset of monitoring wells not critical to long term performance monitoring will be abandoned during remedial action. Monitoring wells will be abandoned in accordance with CP-43 Commissioner's Policy on Groundwater Monitoring Well Decommissioning. Monitoring wells proposed for abandonment are listed on **Table 2-4**.

The SMP will outline the frequency of monitoring well inspection and the procedures for correction action and/or well abandonment following completion of remedial action activities and/or compliance monitoring.

2.5 Soil Vapor Intrusion Evaluation

Soil vapor intrusion evaluation includes tracking and sampling of monitored locations and previously unresponsive or declined locations, as well as sampling of additional properties within the boundary limits of the soil vapor intrusion study area. The evaluation includes provisions for implementing actions recommended to address exposures related to soil vapor intrusion, including installation of a sub-slab depressurization (SSD) system, or a similar engineered system, to mitigate the migration of vapors into the building from groundwater, if warranted. The current status of soil vapor intrusion, current boundary lines, and areas for initial evaluation during the 2017-2018 heating season are identified on **Figure 2-9**.

2.5.1 Interim Remedial Measures

Between 2004 and 2014, 69 properties were installed with a SSD system to address potential exposures related to soil vapor intrusion of TCE. Routine and non-routine inspection and maintenance has been performed on existing SSD systems. An inspection and maintenance (I&M) plan will be provided in the SMP.

2.5.2 Soil Vapor Monitoring

As June 2017, 79 properties were issued no further action for vapor monitoring, 16 properties require annual monitoring, and 29 properties were identified for initial monitoring during the next heating season. A monitoring plan will be provided in the SMP and will outline the specific parameters, sampling locations and quality control procedures.

2.6 Institutional and Engineering Controls

An Environmental Easement will be established for the entire Site as an institutional control to establish land use restrictions necessary to protect current and future users from any contaminants that remain above the unrestricted use soil clean-up objectives and/or above the groundwater protection standards. The

location of the Environmental Easement is shown on **Figure 2-10**. A copy of the DEC Environmental Easement template and Environmental Easement checklist is provided as **Appendix F**. A copy of the City of Norwich Tax maps highlighting the Site is provided as **Appendix G**.

The land on which the remedial action activities are to take place are reportedly owned by the NYS&W Railway Corp, the entity which has granted access to Hercules and its contractors for the various investigations here. The title to the land is in the name of Chenango County Industrial Development Agency. Any environmental easements and/or property restrictions required as part of the remedial action will be assigned to the property owner of record.

Installation of a SSD system, or a similar engineered system, is evaluated on a structure-by-structure basis in accordance with the Guidance for Evaluating Soil Vapor Intrusion in the State of New York dated October 2006 and most recently published updates
https://www.health.ny.gov/environmental/indoors/vapor_intrusion/update.htm.

A remedial design for individual mitigation systems is not warranted if remedial contractor has met the requirements set forth in the DER-10 guidance Section 1.5(c) and solely applies to the installation of a mitigation system. If any structural modifications are necessary to the building requiring mitigation, a New York State Professional Engineer (NYSPE) prepared and certified design is required.

An institutional control and engineering control (IEC) plan will be provided in the SMP and will outline the activities required to ensure controls remain protective of the remedial action objectives established for the Site.

2.7 Cost Estimate

Cost estimates for remedial action activities described within this RAWP were initially provided in the DEC-approved FS Report and are reproduced in **Appendix H**.

2.1 Final Engineering Report

A FER will be submitted in accordance with DER-10 Section 5.8(a) through (d) following completion of remedial activities outlined in this RAWP. The FER will document the final remedial actions for the Site, summarize the activities and results of remedial action, and describe the institutional and/or engineering controls. Construction completion reports (CCRs) for IRMs including installation and operation of SSD systems will be referenced in the FER. The FER will reference those properties where mitigation systems were installed and will be maintained under the SMP.

2.2 Electronic Submissions

In accordance with DER-10 Section 1.15 and Section 5.3(d), a compact diskette (CD) of this RAWP is provided in **Appendix I**.

3.0 REMEDIAL ACTION SCHEDULE AND PROGRESS REPORTS

A remedial action schedule is provided as **Figure 3-1**. Per the Order, Hercules will continue to submit quarterly progress reports until the FER is submitted. Progress reports will summarize those activities completed during the reporting period and include remedial design, remedial action and vapor intrusion evaluation activities. The schedule for progress reports is listed below.

Quarter	**Submittal by:**
First	February 10
Second	May 10
Third	August 10
Fourth	November 10

4.0 SITE MANAGEMENT PLAN

A SMP will be developed in accordance with DER-10 guidance Section 6.0 to ensure the proper and effective management of the remedial program. The SMP will include the site management activities set forth in the environmental easement, inspection, maintenance, and monitoring programs and contingency plans. Specifically, the SMP will include the following plans outlined below.

4.1 Institutional Control and Engineering Control Plan

An IEC plan is required for sites that do not allow for unrestricted use. The IEC plan will describe the requirements necessary to ensure all institutional and engineering controls remain in place and are effective, as well as the requirement for certification as outlined in the DER-10 guidance (Section 6.2.1). More specifically, the IEC plan will provide details on the following:

IEC	Mechanism
Institutional Control	Environmental Easement (Site Only)
Engineering Controls	Sub-slab depressurization systems

4.2 Monitoring Plan

A monitoring plan will outline the performance monitoring activities following remedy implementation. The monitoring plan will include a groundwater monitoring program to assess the performance and effectiveness of the remedy and to confirm the protectiveness of the remedy with respect to the shallow public water supply wells (which are currently not in use). The monitoring plan will include a vapor intrusion monitoring program for properties designated for monitoring, for any new buildings developed on-site or for any new building developed off-site in the area of contamination, as may be required by the IEC Plan.

A monitoring plan will outline the specific parameters, frequency, sampling locations, quality control procedures, and the frequency of submittals to the State.

4.3 Inspection and Maintenance Plan

An I&M plan will be incorporated into the SMP and will provide information related to the inspection, maintenance, and reporting of any mechanical and physical component of active vapor mitigation systems. A I&M plan will outline the specific inspection parameters, frequency, quality control procedures, and the frequency of submittals to the State.

5.0 REFERENCES

DEC 1999. 6 NYCRR Part 703 Surface Waters and Groundwater Quality Standards and Groundwater Effluent Limitations. DEC. August 4, 1999.

DEC 2006. 6 NYCRR Part 375 Environmental Restoration Programs. DEC. Effective December 14, 2006.

DEC 2009. CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009.

DEC 2010. DER-10 Technical Guidance for Site Investigation and Remediation. DEC. May 3, 2010.

DEC 2017. Record of Decision, DEC. March 31, 2017.

DOH 2006. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, New York State Department of Health. October 2006.

EHS 2012. Remedial Investigation/Feasibility Study Workplan, Lee Avenue Railroad Area, Norwich, New York. DEC #709014. EHS Support LLC, September 28, 2012.

EHS 2014. Remedial Investigation Report, Lee Avenue Railroad Area, Norwich, New York. DEC Site #709014. EHS Support LLC, May 12, 2014.

EHS 2016. Feasibility Study Report, Lee Avenue Railroad Area, Norwich, New York. DEC Site #709014. EHS Support LLC, February 29, 2016.

40 CFR Chapter 1, Subchapter D, Part 144 Underground Injection Control Program, July 7, 2012.

TABLES

Table 2-1
Proposed Imported Soil Sampling Program
Remedial Action Work Plan
Lee Avenue Railroad Area - NYSDEC Site # 709014
Norwich, New York

Backfill Volume	# of Samples	Analytical Screening Parameters	USEPA Method	Laboratory	Sample Type
500-800 Cubic Yards	6	Volatile Organic Compounds:	8260C	TestAmerica	Grab
	2	Semi-Volatile Organic Compounds	8270D		Composite
	2	Metals	6010C/7471A		
	2	Pesticides	8081B		
	2	PCBs	8082A		

Reference NYSDEC DER-10 Guidance: Table 5.4(e)10 Recommended Number of Soil Samples for Soil Imported To or Exported From a Site.

USEPA: United States Environmental Protection Agency

Table 2-2
Monitoring Well Construction Details
Remedial Action Work Plan
Lee Avenue Railroad Area - NYSDEC Site # 709014
Norwich, New York

					Monitoring Well Construction Details						Location		Elevation Details (feet-msl)	
Monitoring Well ID	Investigation Phase (Installed by)	Install Date	Active/ Inactive	Aquifer Screen Location	Boring Depth (feet below grade)	Well Depth (feet below grade)	Screened Interval (feet below grade)	Screened Length (feet)	Casing Diameter (inches)	Well Construction	Northing	Easting	Top of PVC Elevation	Ground Surface Elevation
LARW11_1	Superfund	20-Jul-11	Active	Shale Bedrock	31.5	31.5	21.5 - 31.5	10.0	2	.010 slot Sch 40 PVC	926655.58	1106227.37	1011.64	1011.94
LARW11_2	Superfund	19-Jul-11	Active	Shale Bedrock	31.5	31.5	21.5 - 31.5	10.0	2	.010 slot Sch 40 PVC	926412.76	1106223.75	1011.90	1012.26
LARW11_3	Superfund	18-Jul-11	Active	Shale Bedrock	41.5	41.5	31.5 - 41.5	10.0	2	.010 slot Sch 40 PVC	926248.60	1106223.94	1012.28	1012.55
MW-10R	Hercules	5-Feb-13	Active	Shale Bedrock	41.0	40.5	35.5 - 40.5	5.0	2	.010 slot Sch 40 PVC	926474.51	1106227.24	1011.74	1012.26
MW-11R	Hercules	5-Feb-13	Active	Shale Bedrock	17.5	17.5	12.5 - 17.5	5.0	2	.010 slot Sch 40 PVC	926510.95	1106251.02	1011.45	1011.95
URS-1R	ERP	30-Apr-07	Active	Shale Bedrock	24.0	24.0	19.0 - 24.0	5.0	2	.010 slot Sch 40 PVC	926380.60	1106088.25	1028.62	1029.45
URS-3R	ERP	2-May-07	Active	Shale Bedrock	17.3	17.0	12.0 - 17.0	5.0	2	.010 slot Sch 40 PVC	926485.00	1106227.74	1012.66	1012.61
LAOW11_1	Superfund	21-Jul-11	Active	Unconfined Aquifer	21.0	20.0	10.0 - 20.0	10.0	2	.010 slot Sch 40 PVC	926207.80	1106809.51	1008.56	1009.19
LAOW11_2	Superfund	21-Jul-11	Active	Unconfined Aquifer	22.0	20.0	10.0 - 20.0	10.0	2	.010 slot Sch 40 PVC	926356.34	1106951.12	1006.90	1007.53
LAOW11_3	Superfund	21-Jul-11	Active	Unconfined Aquifer	22.0	17.0	7.0 - 17.0	10.0	2	.010 slot Sch 40 PVC	926020.83	1108522.17	997.30	997.51
LAOW11_4	Superfund	11-Aug-11	Active	Unconfined Aquifer	20.0	20.0	15.0 - 20.0	5.0	0.75	.010 slot Sch 40 PVC	925951.62	1106625.90	1010.20	1010.42
LAOW11_5	Superfund	2-Aug-11	Active	Unconfined Aquifer	20.0	20.0	15.0 - 20.0	5.0	0.75	.010 slot Sch 40 PVC	925662.09	1106658.93	1011.50	1011.66
LAOW11_6	Superfund	11-Aug-11	Active	Unconfined Aquifer	20.0	20.0	15.0 - 20.0	5.0	0.75	.010 slot Sch 40 PVC	925763.88	1107063.97	1008.42	1008.56
LAOW11_9	Superfund	2-Aug-11	Active	Unconfined Aquifer	20.0	20.0	15.0 - 20.0	5.0	0.75	.010 slot Sch 40 PVC	925362.16	1107920.57	1001.37	1001.43
MW-2	Hercules	29-Jun-92	Active	Unconfined Aquifer	16.0	15.0	8.0 - 15.0	7.0	2	.010 slot Sch 40 PVC	926412.83	1106455.77	1010.09	1008.68
MW-3	Hercules	29-Jun-92	Active	Unconfined Aquifer	16.0	15.0	8.0 - 15.0	7.0	2	.010 slot Sch 40 PVC	926328.18	1106450.11	1008.25	1008.29
MW-4	Hercules	25-Mar-94	Active	Unconfined Aquifer	10.3	8.9	3.9 - 8.9	5.0	1	.010 slot Sch 40 PVC	926292.02	1106279.03	1011.83	1011.96
MW-5	Hercules	16-Aug-04	Active	Unconfined Aquifer	15 R	15.0	5.0 - 15.0	10.0	2	.010 slot Sch 40 PVC	926547.57	1106350.64	1008.92	1009.14
MW-6	Hercules	16-Aug-04	Active	Unconfined Aquifer	17 R	17.0	7.0 - 17.0	10.0	2	.010 slot Sch 40 PVC	926298.41	1106313.35	1011.07	1011.35
MW-7	Hercules	17-Aug-04	Active	Unconfined Aquifer	19.0	19.0	9.0 - 19.0	10.0	2	.010 slot Sch 40 PVC	926498.89	1106477.16	1008.74	1008.89
MW-8	Hercules	17-Aug-04	Active	Unconfined Aquifer	17 R	17.0	7.0 - 17.0	10.0	2	.010 slot Sch 40 PVC	926620.49	1106423.63	1008.31	1008.66
MW-9	Hercules	17-Aug-04	Active	Unconfined Aquifer	17 R	17.0	7.0 - 17.0	10.0	2	.010 slot Sch 40 PVC	926293.64	1106550.43	1008.33	1008.51
MW-12	Hercules	5-Feb-13	Active	Unconfined Aquifer	16.0	14.0	9.0 - 14.0	5.0	2	.010 slot Sch 40 PVC	925738.29	1106451.06	1011.94	1012.78
MW-13	Hercules	11-Feb-13	Active	Unconfined Aquifer	14.0	12.0	7.0 - 12.0	5.0	2	.010 slot Sch 40 PVC	925171.48	1107069.27	1006.79	1007.04
MW-14	Hercules	7-Feb-13	Active	Unconfined Aquifer	18.0	17.0	12.0 - 17.0	5.0	2	.010 slot Sch 40 PVC	925423.20	1108634.98	997.92	998.12
MW-15	Hercules	11-Feb-13	Active	Unconfined Aquifer	16.0	14.0	9.0 - 14.0	5.0	2	.010 slot Sch 40 PVC	924890.14	1107985.88	1000.22	1000.92
MW-16	Hercules	6-Feb-13	Active	Unconfined Aquifer	18.0	16.0	11.0 - 16.0	5.0	2	.010 slot Sch 40 PVC	924999.44	1109451.52	995.84	996.56
MW-17	Hercules	6-Feb-13	Active	Unconfined Aquifer	10.0	8.0	3.0 - 8.0	5.0	2	.010 slot Sch 40 PVC	924452.38	1108818.84	995.98	996.57
MW-18	Hercules	11-Feb-13	Active	Unconfined Aquifer	20.0	18.0	13.0 - 18.0	5.0	2	.010 slot Sch 40 PVC	926115.80	1106587.17	1010.27	1010.77
MW-19	Hercules	5-Feb-13	Active	Unconfined Aquifer	22.0	20.0	15.0 - 20.0	5.0	2	.010 slot Sch 40 PVC	926036.51	1108741.09	996.99	997.44
MW-20	Hercules	7-Feb-13	Active	Unconfined Aquifer	28.0	27.0	22.0 - 27.0	5.0	2	.010 slot Sch 40 PVC	926269.23	1107826.88	1001.82	1002.53
MW-22	Hercules	11-Feb-13	Active	Unconfined Aquifer	20.0	18.0	13.0 - 18.0	5.0	2	.010 slot Sch 40 PVC	927346.34	1107177.17	1001.74	1002.16
URS-2S	ERP	8-May-07	Active	Unconfined Aquifer	16.0	16.0	11.0 - 16.0	5.0	2	.010 slot Sch 40 PVC	926982.79	1106961.55	1005.12	1005.31
URS-4S	ERP	7-May-07	Active	Unconfined Aquifer	11.0	11.0	6.0 - 11.0	5.0	2	.010 slot Sch 40 PVC	926000.51	1106173.51	1010.81	1011.04
URS-6I	ERP	8-May-07	Active	Unconfined Aquifer	18.0	16.0	11.0 - 16.0	5.0	2	.010 slot Sch 40 PVC	926849.63	1106343.51	1007.57	1007.89
URS-7S	ERP	8-May-07	Active	Unconfined Aquifer	16.0	15.0	10.0 - 15.0	5.0	2	.010 slot Sch 40 PVC	926587.52	1106710.64	1007.55	1007.66
URS-8S	ERP	10-May-07	Active	Unconfined Aquifer	18.0	16.0	11.0 - 16.0	5.0	2	.010 slot Sch 40 PVC	926609.35	1107010.09	1005.94	1006.31

Table 2-2
Monitoring Well Construction Details
Remedial Action Work Plan
Lee Avenue Railroad Area - NYSDEC Site # 709014
Norwich, New York

					Monitoring Well Construction Details						Location		Elevation Details (feet-msl)	
Monitoring Well ID	Investigation Phase (Installed by)	Install Date	Active/ Inactive	Aquifer Screen Location	Boring Depth (feet below grade)	Well Depth (feet below grade)	Screened Interval (feet below grade)	Screened Length (feet)	Casing Diameter (inches)	Well Construction	Northing	Easting	Top of PVC Elevation	Ground Surface Elevation
URS-9S	ERP	10-May-07	Active	Unconfined Aquifer	18.0	17.0	12.0 - 17.0	5.0	2	.010 slot Sch 40 PVC	926618.79	1107136.44	1004.85	1005.44
URS-10S	ERP	10-May-07	Active	Unconfined Aquifer	18.0	16.0	11.0 - 16.0	5.0	2	.010 slot Sch 40 PVC	927230.10	1106560.12	1005.74	1006.10
URS-12	ERP	14-May-07	Active	Unconfined Aquifer	16.0	14.0	9.0 - 14.0	5.0	2	.010 slot Sch 40 PVC	926181.97	1107068.16	1006.17	1006.51
URS-13	ERP	14-May-07	Active	Unconfined Aquifer	22.0	16.0	11.0 - 16.0	5.0	2	.010 slot Sch 40 PVC	926277.61	1107832.09	1001.36	1001.90
URS-14	ERP	15-May-07	Active	Unconfined Aquifer	16.0	14.0	9.0 - 14.0	5.0	2	.010 slot Sch 40 PVC	926807.43	1107582.92	1000.33	1000.67

NOTES:

Investigation Phases:

Hercules: Tank Closure/Remediation Activities (1990s) and Implemented under Consent Order with NYSDEC (2012-2013)

ERP: Environmental Restoration Program implemented by Chenango County Industrial Development Agency

Superfund: Implemented by New York State Department of Environmental Conservation and Department of Health

USGS: United States Geological Survey

NA - Not Available/Not Applicable

NE - Not Encountered

feet-msl - Feet above mean sea level

Well construction details for monitoring wells are based on historical investigation reports with the exception of the following:

Well construction details for wells installed by URS are based on well development logs and soil boring logs.

Final Well Construction Logs for wells installed by HDR were not available. Data based on field well construction logs.

Well constructions details for City Wells are based on USGS data provided in EDR Radius Map Report, August 2011.

X, Y Coordinates and Elevation for all provided by Shumaker in March 2013 and September 2013.

X, Y Coordinates and Elevation for MW-4 and MW-6 are based on historic data because wells were not located in the field in 2013.

Table 2-3
Remedial Design Groundwater Sampling Program
Remedial Action Work Plan
Lee Avenue Railroad Area - NYSDEC Site # 709014
Norwich, New York

							Low Flow Purging and Sampling			
							TestAmerica		Microbial Insights	
Monitoring Well ID	Active/ Inactive	Aquifer Screen Location	Well Depth (feet below grade)	Screened Interval (feet below grade)	Well Integrity Inspection	Field-measured analyte	TCL VOCs + TICs	Geochemical Analytes	QuantArray-Chlor	Next Generation Sequencing (NGS)
LARW11_1	Active	Shale Bedrock	31.5	21.5 - 31.5	X	X	X			
LARW11_2	Active	Shale Bedrock	31.5	21.5 - 31.5	X	X	X	X		
LARW11_3	Active	Shale Bedrock	41.5	31.5 - 41.5	X	X	X	X		
MW-10R	Active	Shale Bedrock	40.5	35.5 - 40.5	X	X	X			
MW-11R	Active	Shale Bedrock	17.5	12.5 - 17.5	X	X	X	X		
URS-1R	Active	Shale Bedrock	24.0	19.0 - 24.0	X	X	X	X	X	
URS-3R	Active	Shale Bedrock	17.0	12.0 - 17.0	X	X	X	X	X	X
LAOW11_1	Active	Unconfined Aquifer	20.0	10.0 - 20.0	X	X	X			
LAOW11_2	Active	Unconfined Aquifer	20.0	10.0 - 20.0	X	X	X			
LAOW11_3	Active	Unconfined Aquifer	17.0	7.0 - 17.0	X	X	X			
LAOW11_4	Active	Unconfined Aquifer	20.0	15.0 - 20.0	X	X	X			
LAOW11_5	Active	Unconfined Aquifer	20.0	15.0 - 20.0	X	X	X			
LAOW11_6	Active	Unconfined Aquifer	20.0	15.0 - 20.0	X	X	X			
LAOW11_9	Active	Unconfined Aquifer	20.0	15.0 - 20.0	X	X	X			
MW-2	Active	Unconfined Aquifer	15.0	8.0 - 15.0	X	X	X			
MW-3	Active	Unconfined Aquifer	15.0	8.0 - 15.0	X	X	X			
MW-4	Active	Unconfined Aquifer	8.9	3.9 - 8.9	X	X	X			
MW-5	Active	Unconfined Aquifer	15.0	5.0 - 15.0	X	X	X			
MW-6	Active	Unconfined Aquifer	17.0	7.0 - 17.0	X	X	X			
MW-7	Active	Unconfined Aquifer	19.0	9.0 - 19.0	X	X	X			
MW-8	Active	Unconfined Aquifer	17.0	7.0 - 17.0	X	X	X			
MW-9	Active	Unconfined Aquifer	17.0	7.0 - 17.0	X	X	X			
MW-12	Active	Unconfined Aquifer	14.0	9.0 - 14.0	X	X	X			
MW-13	Active	Unconfined Aquifer	12.0	7.0 - 12.0	X	X	X			
MW-14	Active	Unconfined Aquifer	17.0	12.0 - 17.0	X	X	X			
MW-15	Active	Unconfined Aquifer	14.0	9.0 - 14.0	X	X	X			
MW-16	Active	Unconfined Aquifer	16.0	11.0 - 16.0	X	X	X			
MW-17	Active	Unconfined Aquifer	8.0	3.0 - 8.0	X	X	X			
MW-18	Active	Unconfined Aquifer	18.0	13.0 - 18.0	X	X	X			
MW-19	Active	Unconfined Aquifer	20.0	15.0 - 20.0	X	X	X			
MW-20	Active	Unconfined Aquifer	27.0	22.0 - 27.0	X	X	X			

Table 2-3
Remedial Design Groundwater Sampling Program
Remedial Action Work Plan
Lee Avenue Railroad Area - NYSDEC Site # 709014
Norwich, New York

							TestAmerica		Microbial Insights	
Monitoring Well ID	Active/ Inactive	Aquifer Screen Location	Well Depth (feet below grade)	Screened Interval (feet below grade)	Well Integrity Inspection	Field-measured analyte	TCL VOCs + TICs	Geochemical Analytes	QuantArray-Chlor	Next Generation Sequencing (NGS)
MW-22	Active	Unconfined Aquifer	18.0	13.0 - 18.0	X	X	X			
URS-2S	Active	Unconfined Aquifer	16.0	11.0 - 16.0	X	X	X			
URS-4S	Active	Unconfined Aquifer	11.0	6.0 - 11.0	X	X	X			
URS-6I	Active	Unconfined Aquifer	16.0	11.0 - 16.0	X	X	X			
URS-7S	Active	Unconfined Aquifer	15.0	10.0 - 15.0	X	X	X	X	X	X
URS-8S	Active	Unconfined Aquifer	16.0	11.0 - 16.0	X	X	X	X		
URS-9S	Active	Unconfined Aquifer	17.0	12.0 - 17.0	X	X	X	X	X	
URS-10S	Active	Unconfined Aquifer	16.0	11.0 - 16.0	X	X	X			
URS-12	Active	Unconfined Aquifer	14.0	9.0 - 14.0	X	X	X			
URS-13	Active	Unconfined Aquifer	16.0	11.0 - 16.0	X	X	X			
URS-14	Active	Unconfined Aquifer	14.0	9.0 - 14.0	X	X	X			

Geochemical Analytes: Dissolved Gasses (Ethene, Ethane, Methane, Ethyne/acetylene, Dissolved Carbon Dioxide, Chloride ion (Cl-); Nitrate, Sulfate, Sulfide; Dissolved iron; Volatile fatty acids (VFAs); Total Organic Carbon (TOC)

Table 2-4
Monitoring Wells Proposed for Abandonment
Remedial Action Work Plan
Lee Avenue Railroad Area - NYSDEC Site # 709014
Norwich, New York

Monitoring Well ID	Install Date	Active/ Inactive	Aquifer Screen Location	Boring Depth (feet below grade)	Well Depth (feet below grade)	Screened Interval (feet below grade)	Screened Length (feet)	Casing Diameter (inches)	Well Construction	Northing	Easting	Rationalization
LAOW11_1	21-Jul-11	Active	Unconfined Aquifer	21.0	20.0	10.0 - 20.0	10.0	2	.010 slot Sch 40 PVC	926207.80	1106809.51	Proximity to upgradient and downgradient wells.
LAOW11_2	21-Jul-11	Active	Unconfined Aquifer	22.0	20.0	10.0 - 20.0	10.0	2	.010 slot Sch 40 PVC	926356.34	1106951.12	
LAOW11_3	21-Jul-11	Active	Unconfined Aquifer	22.0	17.0	7.0 - 17.0	10.0	2	.010 slot Sch 40 PVC	926020.83	1108522.17	
MW-2	29-Jun-92	Active	Unconfined Aquifer	16.0	15.0	8.0 - 15.0	7.0	2	.010 slot Sch 40 PVC	926412.83	1106455.77	Age and proximity to existing monitoring wells on Lee Avenue.
MW-3	29-Jun-92	Active	Unconfined Aquifer	16.0	15.0	8.0 - 15.0	7.0	2	.010 slot Sch 40 PVC	926328.18	1106450.11	
MW-4	25-Mar-94	Active	Unconfined Aquifer	10.3	8.9	3.9 - 8.9	5.0	1	.010 slot Sch 40 PVC	926292.02	1106279.03	
MW-5	16-Aug-04	Active	Unconfined Aquifer	15 R	15.0	5.0 - 15.0	10.0	2	.010 slot Sch 40 PVC	926547.57	1106350.64	
MW-6	16-Aug-04	Active	Unconfined Aquifer	17 R	17.0	7.0 - 17.0	10.0	2	.010 slot Sch 40 PVC	926298.41	1106313.35	
MW-22	11-Feb-13	Active	Unconfined Aquifer	20.0	18.0	13.0 - 18.0	5.0	2	.010 slot Sch 40 PVC	927346.34	1107177.17	Clean and needs repair

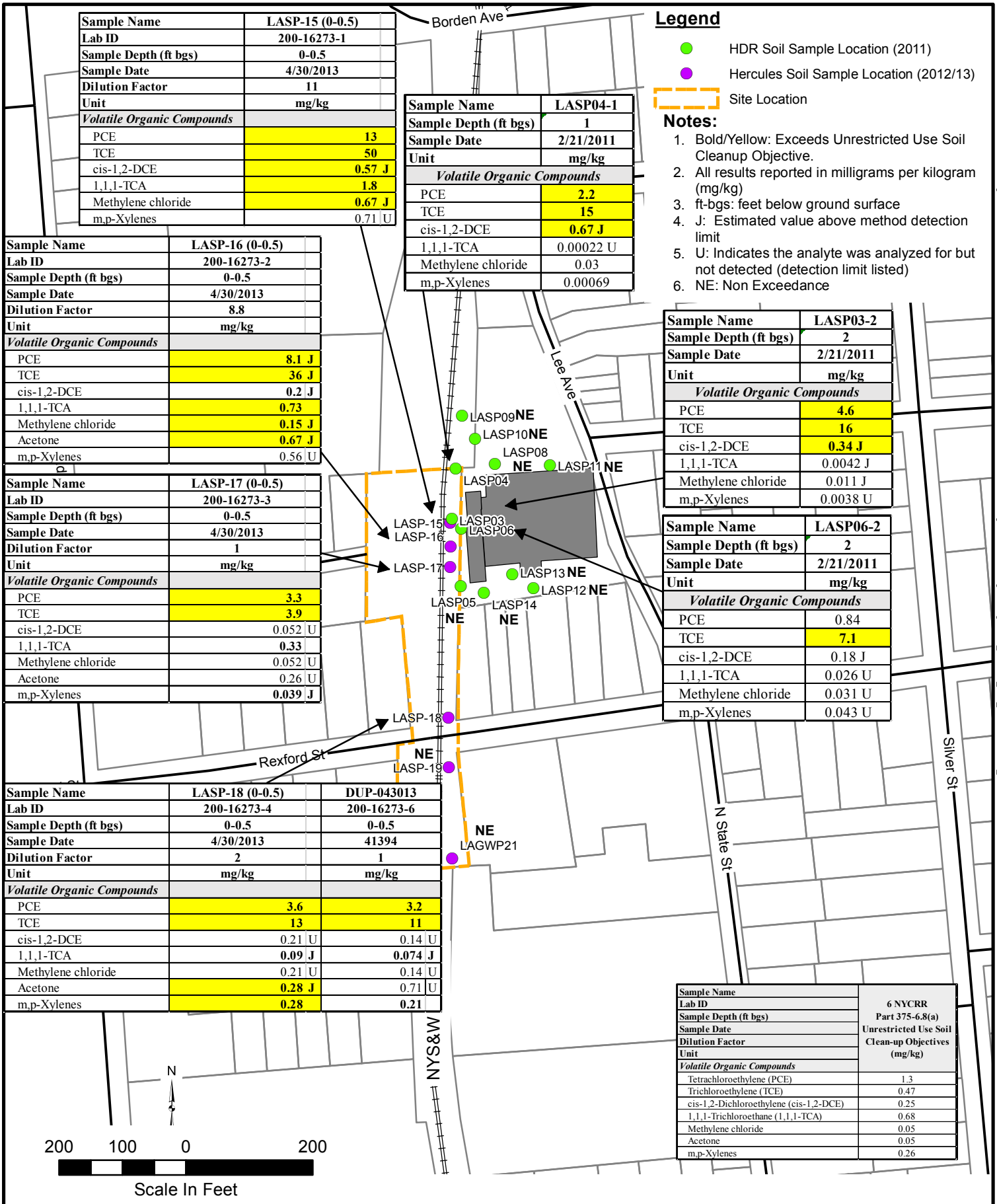
FIGURES

C:\Users\Mick.Osburn.EHS\Documents\Drawings\Ashland Simmonds Precision\New GIS Data\MXDs\Remedial Action Work Plan Figures\Revised Figures\Figure 1-1_Norwich_AerialSitePlan.mxd

EHS Support
consider it done

August 2017

FIGURE 1-1
AERIAL SITE PLAN
LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK
NYS #709014



Sample Name	LASP-15 (0-0.5)
Lab ID	200-16273-1
Sample Depth (ft bgs)	0-0.5
Sample Date	4/30/2013
Dilution Factor	11
Unit	mg/kg
Volatile Organic Compounds	
PCE	**13**
TCE	**50**
cis-1,2-DCE	**0.57 J**
1,1,1-TCA	**1.8**
Methylene chloride	**0.67 J**
m,p-Xylenes	0.71 U

Sample Name	LASP04-1
Sample Depth (ft bgs)	1
Sample Date	2/21/2011
Unit	mg/kg
Volatile Organic Compounds	
PCE	**2.2**
TCE	**15**
cis-1,2-DCE	**0.67 J**
1,1,1-TCA	0.00022 U
Methylene chloride	0.03
m,p-Xylenes	0.00069

Sample Name	LASP-16 (0-0.5)
Lab ID	200-16273-2
Sample Depth (ft bgs)	0-0.5
Sample Date	4/30/2013
Dilution Factor	8.8
Unit	mg/kg
Volatile Organic Compounds	
PCE	**8.1 J**
TCE	**36 J**
cis-1,2-DCE	**0.2 J**
1,1,1-TCA	**0.73**
Methylene chloride	**0.15 J**
Acetone	**0.67 J**
m,p-Xylenes	0.56 U

Sample Name	LASP-17 (0-0.5)
Lab ID	200-16273-3
Sample Depth (ft bgs)	0-0.5
Sample Date	4/30/2013
Dilution Factor	1
Unit	mg/kg
Volatile Organic Compounds	
PCE	**3.3**
TCE	**3.9**
cis-1,2-DCE	0.052 U
1,1,1-TCA	**0.33**
Methylene chloride	0.052 U
Acetone	0.26 U
m,p-Xylenes	**0.039 J**

Sample Name	LASP03-2
Sample Depth (ft bgs)	2
Sample Date	2/21/2011
Unit	mg/kg
Volatile Organic Compounds	
PCE	**4.6**
TCE	**16**
cis-1,2-DCE	**0.34 J**
1,1,1-TCA	0.0042 J
Methylene chloride	0.011 J
m,p-Xylenes	0.0038 U

Sample Name	LASP06-2
Sample Depth (ft bgs)	2
Sample Date	2/21/2011
Unit	mg/kg
Volatile Organic Compounds	
PCE	0.84
TCE	**7.1**
cis-1,2-DCE	0.18 J
1,1,1-TCA	0.026 U
Methylene chloride	0.031 U
m,p-Xylenes	0.043 U

Sample Name	LASP-18 (0-0.5)	DUP-043013
Lab ID	200-16273-4	200-16273-6
Sample Depth (ft bgs)	0-0.5	0-0.5
Sample Date	4/30/2013	41394
Dilution Factor	2	1
Unit	mg/kg	mg/kg
Volatile Organic Compounds		
PCE	**3.6**	**3.2**
TCE	**13**	**11**
cis-1,2-DCE	0.21 U	0.14 U
1,1,1-TCA	**0.09 J**	**0.074 J**
Methylene chloride	0.21 U	0.14 U
Acetone	**0.28 J**	0.71 U
m,p-Xylenes	**0.28**	**0.21**

Legend

- HDR Soil Sample Location (2011)
- Hercules Soil Sample Location (2012/13)
- Site Location

Notes:

1. Bold/Yellow: Exceeds Unrestricted Use Soil Cleanup Objective.
2. All results reported in milligrams per kilogram (mg/kg)
3. ft-bgs: feet below ground surface
4. J: Estimated value above method detection limit
5. U: Indicates the analyte was analyzed for but not detected (detection limit listed)
6. NE: Non Exceedance

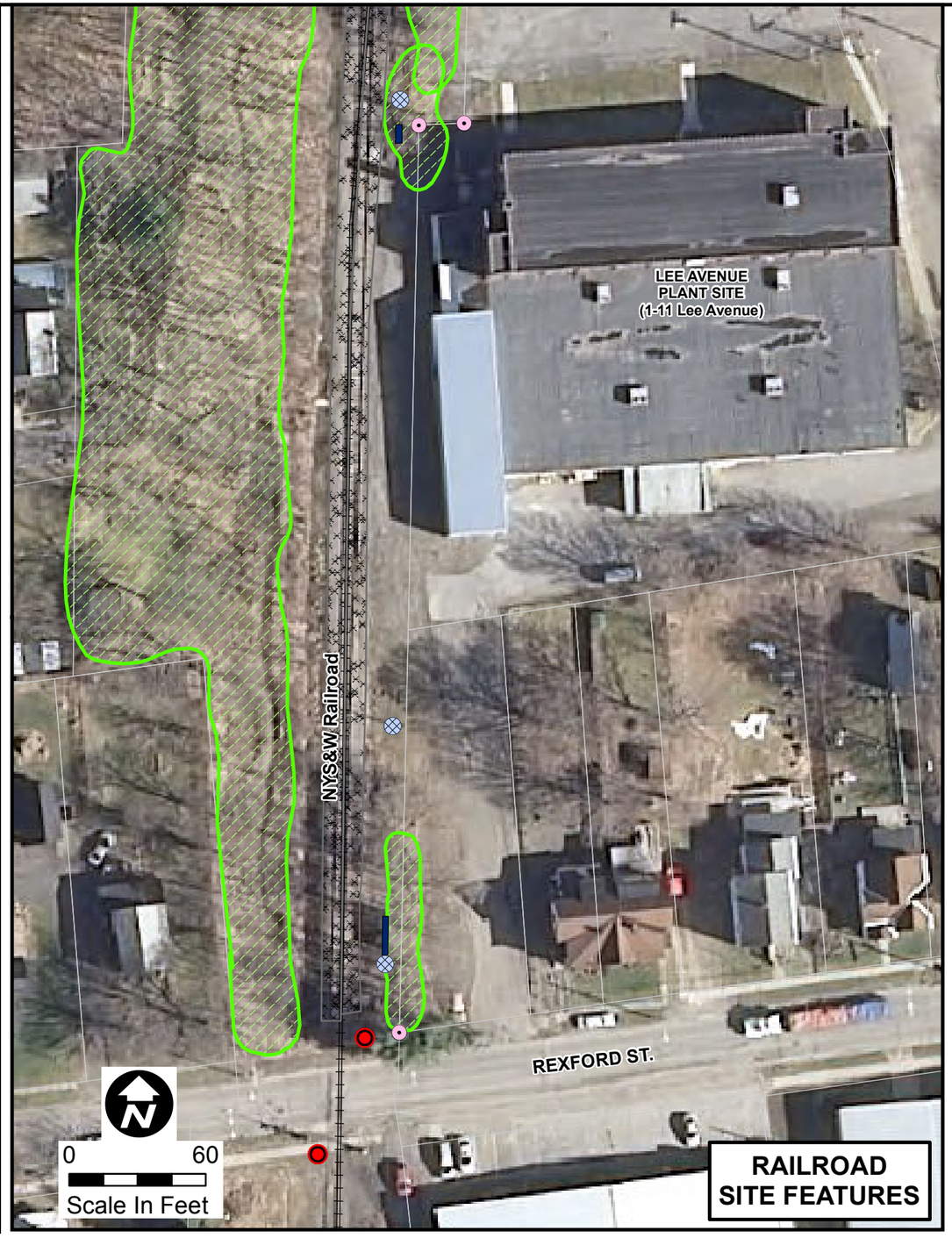
Sample Name	6 NYCRR Part 375-6.8(a) Unrestricted Use Soil Clean-up Objectives (mg/kg)
Lab ID	
Sample Depth (ft bgs)	
Sample Date	
Dilution Factor	
Unit	
Volatile Organic Compounds	
Tetrachloroethylene (PCE)	1.3
Trichloroethylene (TCE)	0.47
cis-1,2-Dichloroethylene (cis-1,2-DCE)	0.25
1,1,1-Trichloroethane (1,1,1-TCA)	0.68
Methylene chloride	0.05
Acetone	0.05
m,p-Xylenes	0.26

EHS Support *consider it done*

August 2017

FIGURE 2-1
EXCEEDANCE OF PROTECTION OF GROUNDWATER SOIL CLEAN-UP OBJECTIVES - VOLATILE ORGANIC COMPOUNDS
LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK - NYS #709014

C:\Users\Mick.Osburn.EHS\Documents\Drawings\Ashland Simmonds Precision\New GIS Data\MXDs\Remedial Action Work Plan Figures\Revised Figures\Figure2-1_Norwich_GW_SoilExceedance_VOC.mxd



Legend

- Lee Avenue Railroad Area Site
- Soil Remedial Action Area
- Railroad Power Poles (Not in Service)
- Property Pins
- Railroad Crossing Signal
- Railroad Ballast
- Railroad Signal Panel
- Tree Canopy
- Tax Parcel
- Railroad

Reference Notes:

Lot and Block data provided by the City of Norwich.

Figure 1-1 Aerial Site Plan

Site Features observed on July 20, 2017

C:\Users\Mick.Osburn.EHS\Documents\Drawings\Ashland Simmonds Precision\New GIS Data\MXDs\Remedial Action Work Plan Figures\Revised Figures\Figure2-2_Norwick_Soil_Remediation_Area.mxd

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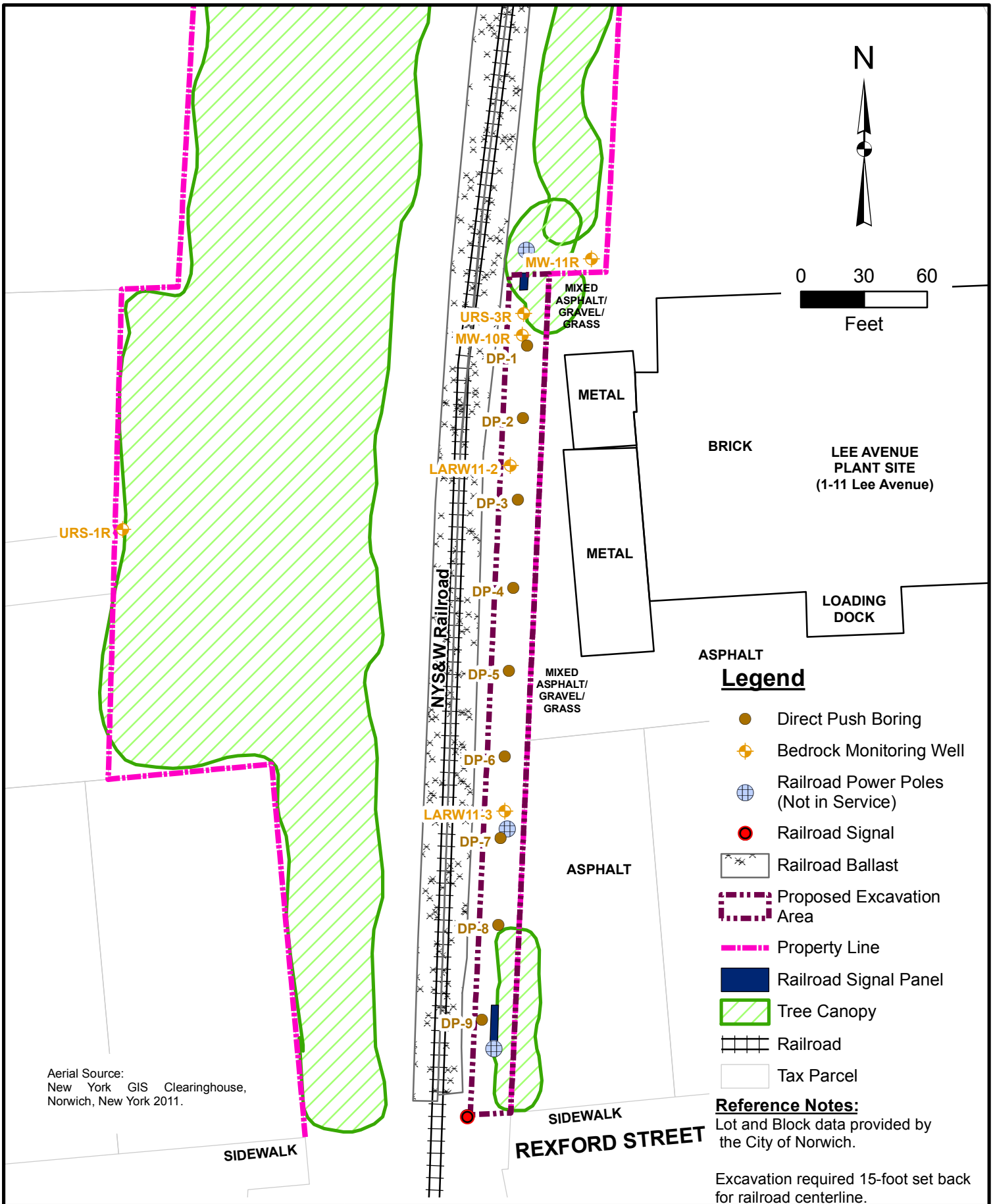
August 2017

Rev.	Rev. By	Description	Date

LEE AVENUE RAILROAD AREA
REMEDIAL ACTION WORK PLAN
NORWICH, NEW YORK
NYS #709014

FIGURE 2-2
SOIL REMEDIATION AREA

Drawn By: MDO	Date Drawn: 08/2017
Review By: MSS	Date Review: 08/2017
Scale: As Shown	Plot Date: 08/2017
Project No.: C00287_2017	Figure 2-2



EHS Support
consider it done

August 2017

FIGURE 2-3
REMEDIAL DESIGN SOIL BORINGS - JULY 19, 2017
LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK
NYS #709014

NORTH
E

SOUTH
E'

LEE AVENUE RAILROAD AREA / NEW YORK SUSQUEHANNA AND WESTERN RAILROAD

REXFORD ST.
W - E

PROPOSED SOIL EXCAVATION AREA

400-FT. (NORTH - SOUTH)

SURFACE TO TOP OF BEDROCK

NORTHERN EXTENT
LOT LINE

SOUTHERN EXTENT
REXFORD STREET SIDEWALK

POLE (INACTIVE)

POLE (INACTIVE)

POLE (INACTIVE)

SIGNAL PANEL

SIGNAL PANEL

RR SIGNAL

ELEVATION

1027

1017

1007

997

987

977

967

LARW11-1

MW-11R

URS-3R

MW-10R

LARW11-2

LARW11-3

URS-4S

1010.45

1009.51

1010.61

1011.76

1007.94

1007.76

1006.69

1008.55

1001.67

1002.38

1000.55

1000.51

1002.51

1000.04

SAND / SILT / GRAVEL

SAND / SILT / GRAVEL

SHALE / SILTSTONE BEDROCK

SHALE / SILTSTONE BEDROCK

SHALE / SILTSTONE BEDROCK

Rock: 1.5 ft
Screen: 12.5 - 17.5
TD: 19.5 ft

Rock: 11 ft
Screen: 6 - 11 ft
TD: 11 ft

MASSIVE SHALE BOUNDARY RANGE IS APPROXIMATE

Rock: 4 ft
Screen: 21.5 - 31.5
TD: 31.5 ft

Rock: 4.5 ft
Screen: 21.5 - 31.5
TD: 31.5 ft

Rock: 2 ft
Screen: 11.8 - 16.8
TD: 17.3 ft

Rock: 0.5 ft
Screen: 35.5 - 40.5
TD: 41 ft

Rock: 4 ft
Screen: 31.5 - 41.5
TD: 41.5 ft

DEPTH OF VALLEY FLOOR SUSPECTED TO BE 700 FEET MSL

0 60 120 180 240 300 360 420 480 540 600 660 720 780 840

DISTANCE IN FEET

LEGEND

- WELL RISER
- WELL SCREEN
- SHALE / SILTSTONE
- SAND / SILT / GRAVEL
- CLAY
- GROUNDWATER ELEVATION
- WATER LEVEL
- DASHED WHERE INFERRED
- TD — TOTAL DEPTH IN FEET (ft)
- 1007.94 — BEDROCK ELEVATION (ft)

NOTES:

- DIRECT PUSH BORINGS COMPLETED ON JULY 19, 2017. SURVEY NOT COMPLETE. SITE FEATURES ADDED BASED ON FIELD OBSERVATIONS.
- SOIL LITHOLOGY AND MONITORING WELL CONSTRUCTION DETAILS ARE BASED ON SOIL BORING/WELL CONSTRUCTION LOGS AT TIME OF INSTALLATION.
- ELEVATIONS ARE PROVIDED IN FEET ABOVE MEAN SEA LEVEL (MSL).
- GROUNDWATER ELEVATIONS WERE COLLECTED MARCH 7, 2013.

REFERENCE:

REMEDIAL INVESTIGATION REPORT, FIGURE 12 HYDROGEOLOGIC CROSS SECTION E-E', MAY 12, 2014.

VERTICAL SCALE
SCALE IN FEET
10
0

0 60
HORIZONTAL SCALE
SCALE IN FEET

EHS Support
consider it done

REVISIONS

Rev.		By:	Disc.:	Date:
Rev.		By:	Disc.:	Date:
Rev.		By:	Disc.:	Date:
Rev.		By:	Disc.:	Date:

LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK
NYS #709014

FIGURE 2-4
PROPOSED SOIL REMEDIAL ACTION AREA

Drawn By:	MDO	Date Drawn:	07/2017
Reviewed By:	MSS	Date Reviewed:	07/2017
Scale:	As Shown	Plot Date:	07/2017
Project Number.: C00287-2017		Figure 2-4	

Client ID	URS-1R		
Lab ID	R1104471-007	R1106001-013	200-15458-1
Date	8/11/2011	10/26/2011	3/11/2013
Chloroethenes			
Trichloroethene	0.23 U	0.23 U	1.0 U
Tetrachloroethene	0.20 U	0.20 U	1.0 U
cis-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
trans-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
1,1-Dichloroethene	0.29 U	0.29 U	1.0 U
Vinyl chloride	0.23 U	0.23 U	1.0 U
Chloroethanes			
1,1,1-Trichloroethane	0.23 U	0.23 U	1.0 U
1,1-Dichloroethane	0.20 U	0.20 U	1.0 U
Aromatic Hydrocarbons			
Toluene	0.20 U	0.20 U	1.0 U

Client ID	MW-11R	
Lab ID	200-15632-1	200-18709-2
Date	3/20/2013	9/27/2013
Chloroethenes		
Trichloroethene	29,000	12,000
Tetrachloroethene	400 U	220 U
cis-1,2-Dichloroethene	600	540
trans-1,2-Dichloroethene	400 U	220 U
1,1-Dichloroethene	320 J	160 J
Vinyl chloride	400 U	220 U
Chloroethanes		
1,1,1-Trichloroethane	1,100	740
1,1-Dichloroethane	770	390
Aromatic Hydrocarbons		
Toluene	68 J	220 U

Client ID	URS-3R		
Lab ID	R1104584-015	R1106001-011	200-15651-1
Date	8/18/2011	10/26/2011	3/21/2013
Chloroethenes			
Trichloroethene	70,000	37,000	36,000
Tetrachloroethene	100 U	50 U	400 U
cis-1,2-Dichloroethene	16,000	11,000	4,600
trans-1,2-Dichloroethene	100 U	50 U	400 U
1,1-Dichloroethene	350 J	190 J	210 J
Vinyl chloride	420 J	140 J	420
Chloroethanes			
1,1,1-Trichloroethane	460 J	210 J	110 J
1,1-Dichloroethane	1,500 J	1,200 J	510
Aromatic Hydrocarbons			
Toluene	470 J	78 J	120 J

Client ID	LARW11-2		
Lab ID	R1104584-019	R1106001-010	200-15632-5
Date	8/18/2011	10/26/2011	3/20/2013
Chloroethenes			
Trichloroethene	220 D	520 D	820
Tetrachloroethene	210 D	270 D	21
cis-1,2-Dichloroethene	310 D	960 D	1,000
trans-1,2-Dichloroethene	2.80 J	39	67
1,1-Dichloroethene	1.20 J	4.70 J	6.0 J
Vinyl chloride	5.7	15	17
Chloroethanes			
1,1,1-Trichloroethane	0.23 U	0.23 U	17.0 U
1,1-Dichloroethane	2.0 J	14.0	16.0 J
Aromatic Hydrocarbons			
Toluene	0.23 J	0.20 U	17.0 U

Client ID	LARW11-1		
Lab ID	R1104584-020	R1106001-008	200-15458-3
Date	8/18/2011	10/25/2011	3/11/2013
Chloroethenes			
Trichloroethene	0.85 J	0.23 U	1.0 U
Tetrachloroethene	0.20 U	0.20 U	1.0 U
cis-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
trans-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
1,1-Dichloroethene	0.29 U	0.29 U	1.0 U
Vinyl chloride	0.23 U	0.23 U	1.0 U
Chloroethanes			
1,1,1-Trichloroethane	0.23 U	0.23 U	1.0 U
1,1-Dichloroethane	0.20 U	0.20 U	1.0 U
Aromatic Hydrocarbons			
Toluene	0.20 U	0.20 U	1.0 U

Client ID	MW-10R	
Lab ID	200-15632-4	200-18709-1
Date	3/20/2013	9/27/2013
Chloroethenes		
Trichloroethene	1.0 U	0.91 J
Tetrachloroethene	1.0 U	1.0 U
cis-1,2-Dichloroethene	1.0 U	1.0 U
trans-1,2-Dichloroethene	1.0 U	1.0 U
1,1-Dichloroethene	1.0 U	1.0 U
Vinyl chloride	1.0 U	1.0 U
Chloroethanes		
1,1,1-Trichloroethane	1.0 U	1.0 U
1,1-Dichloroethane	1.0 U	1.0 U
Aromatic Hydrocarbons		
Toluene	1.0 U	0.24 J

Client ID	LARW11-3		
Lab ID	R1104584-018	R1106001-001	200-15499-9
Date	8/17/2011	10/24/2011	3/13/2013
Chloroethenes			
Trichloroethene	0.69 J	1.30 J	2.90
Tetrachloroethene	0.20 U	0.20 U	1.0 U
cis-1,2-Dichloroethene	0.53 J	0.44 J	0.70 J
trans-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
1,1-Dichloroethene	0.29 U	0.29 U	0.40 J
Vinyl chloride	0.24 J	0.23 U	0.34 J
Chloroethanes			
1,1,1-Trichloroethane	0.62 J	0.37 J	1.10
1,1-Dichloroethane	2.20 J	2.00 J	4.60
Aromatic Hydrocarbons			
Toluene	0.20 U	0.20 U	1.0 U

NYSDEC Class GA Groundwater	
Chloroethenes	
Trichloroethene	5
Tetrachloroethene	5
cis-1,2-Dichloroethene	5
trans-1,2-Dichloroethene	5
1,1-Dichloroethene	5
Vinyl chloride	2
Chloroethanes	
1,1,1-Trichloroethane	5
1,1-Dichloroethane	5
Aromatic Hydrocarbons	
Toluene	5

Legend

- Unconfined Monitoring Well
- Bedrock Monitoring Well
- Investigation Study Area
- Site Location

Notes:

All results reported in micrograms per liter

J = Concentration is an estimated value above the reported method detection limit, but below the laboratory reporting limit.

U = Constituent was not detected above the reported laboratory reporting limit.

TCE = Trichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
PCE = Tetrachloroethene
NS = Not Sampled
NL = Not Located in the Field

360 180 0 360

Scale In Feet

C:\Users\Mick.Osburn.EHS\Documents\Drawings\Ashland Simmonds Precision\New GIS Data\MXDs\Remedial Action Work Plan Figures\Revised Figures\Figure2-5_Norwich_GWSamplingSummary_20130data.mxd

EHS Support *consider it done*

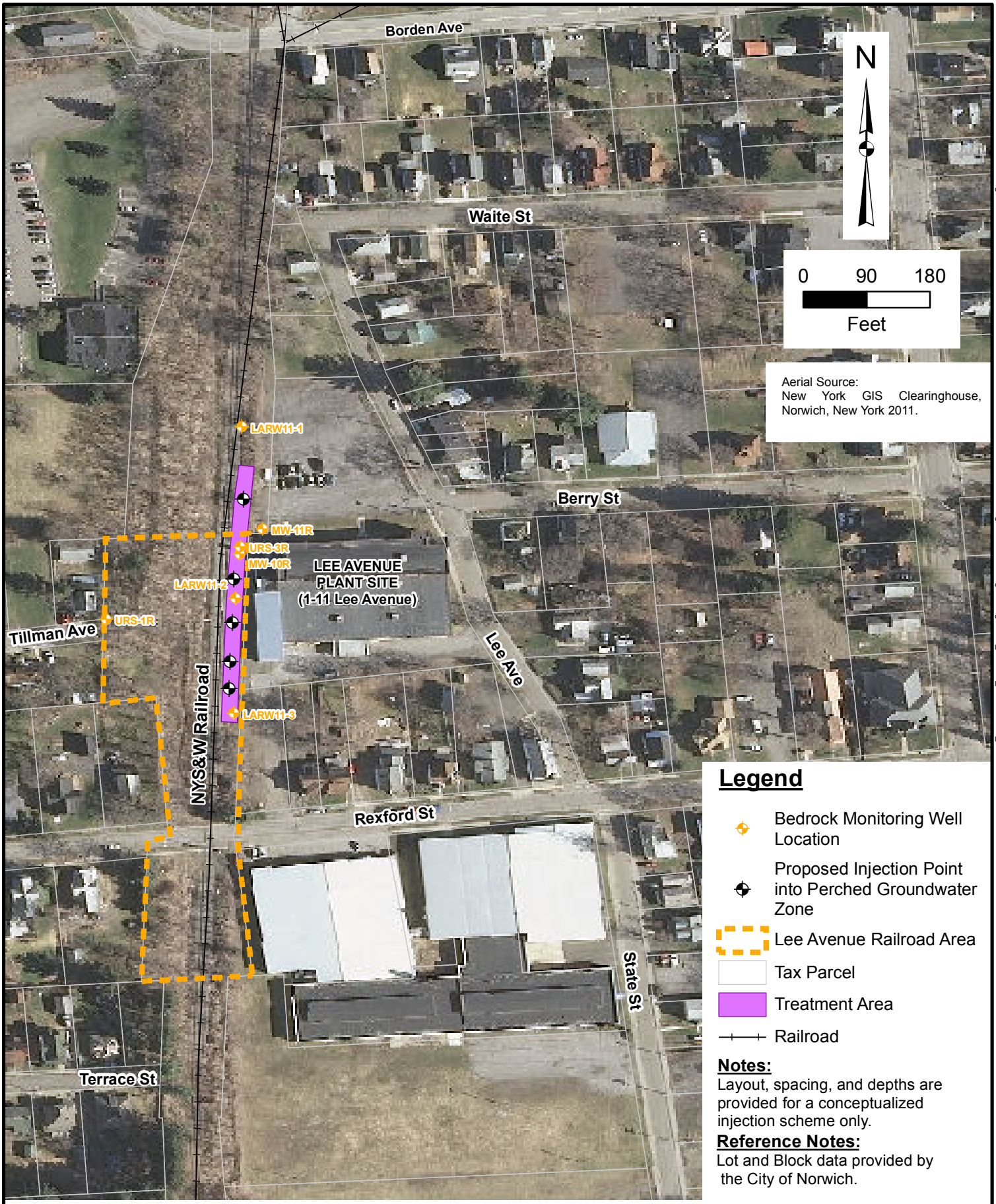
August 2017

Rev.	Rev. By	Description	Date

LEE AVENUE RAILROAD AREA REMEDIAL ACTION WORK PLAN NORWICH, NEW YORK NYS #709014

FIGURE 2-5 REMEDIAL INVESTIGATION MONITORING WELL LOCATIONS AND ANALYTICAL EXCEEDANCE MAP

Drawn By: MDO	Date Drawn: 08/2017
Review By: MSS	Date Review: 08/2017
Scale: 1" = 360'	Plot Date: 08/2017
Project No.: C00287_2017	Figure 2-5



EHS Support
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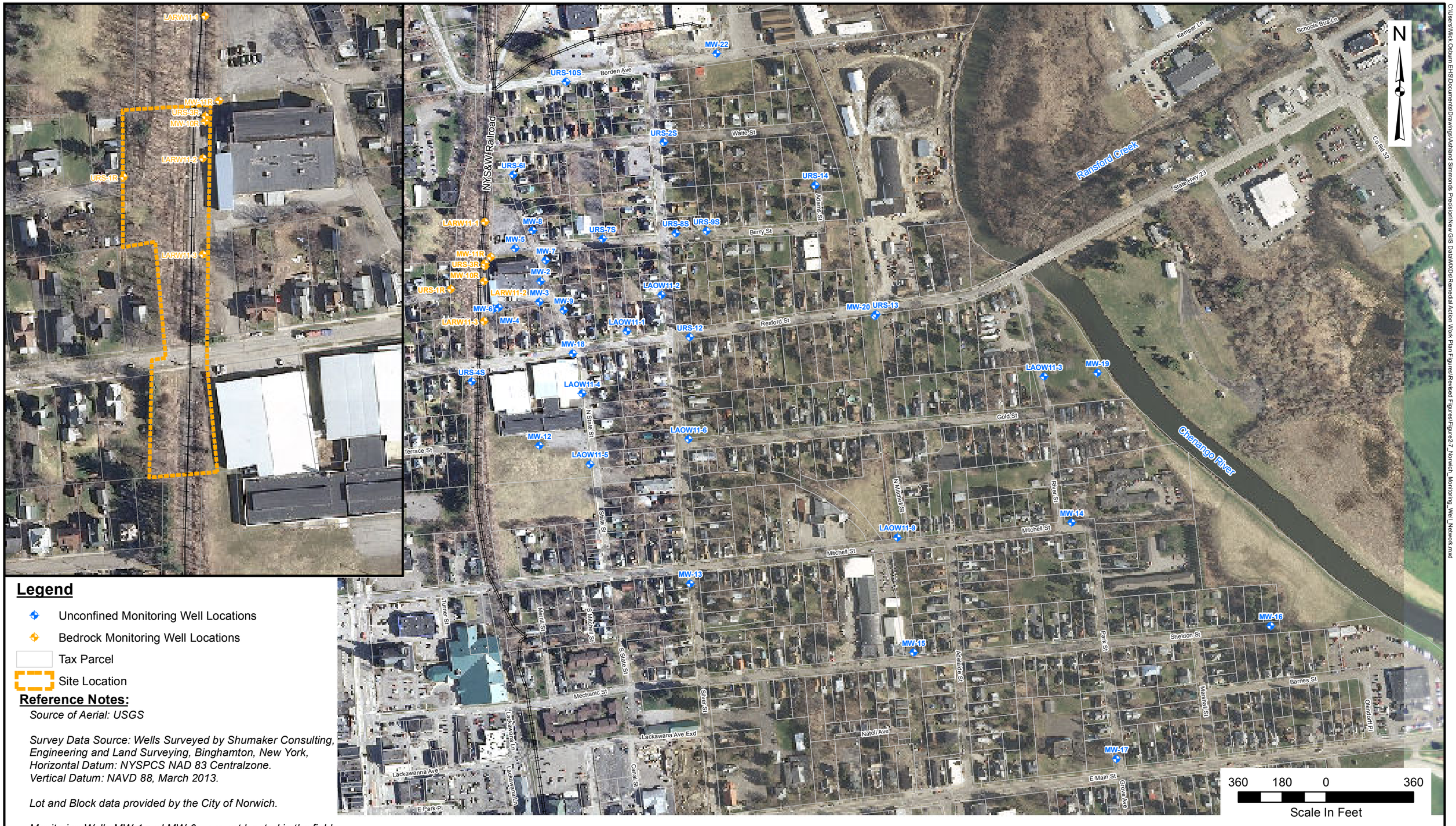
August 2017

FIGURE 2-6
GROUNDWATER IN-SITU TREATMENT AREA
LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK
NYS #709014

C:\Users\Mick.Osburn.EHS\Documents\Drawings\Ashland Simmonds Precision\New GIS Data\MXDs\Remedial Action Work Plan Figures\Revised Figures\Figure2-6_Norwich_Groundwater_InSituTreatmentArea.mxd



Legend

- Unconfined Monitoring Well Locations
- Bedrock Monitoring Well Locations
- Tax Parcel
- Site Location

Reference Notes:

Source of Aerial: USGS

Survey Data Source: Wells Surveyed by Shumaker Consulting, Engineering and Land Surveying, Binghamton, New York, Horizontal Datum: NYSPCS NAD 83 Centralzone. Vertical Datum: NAVD 88, March 2013.

Lot and Block data provided by the City of Norwich.

Monitoring Wells MW-4 and MW-6 were not located in the field.

EHS Support *consider it done*

August 2017

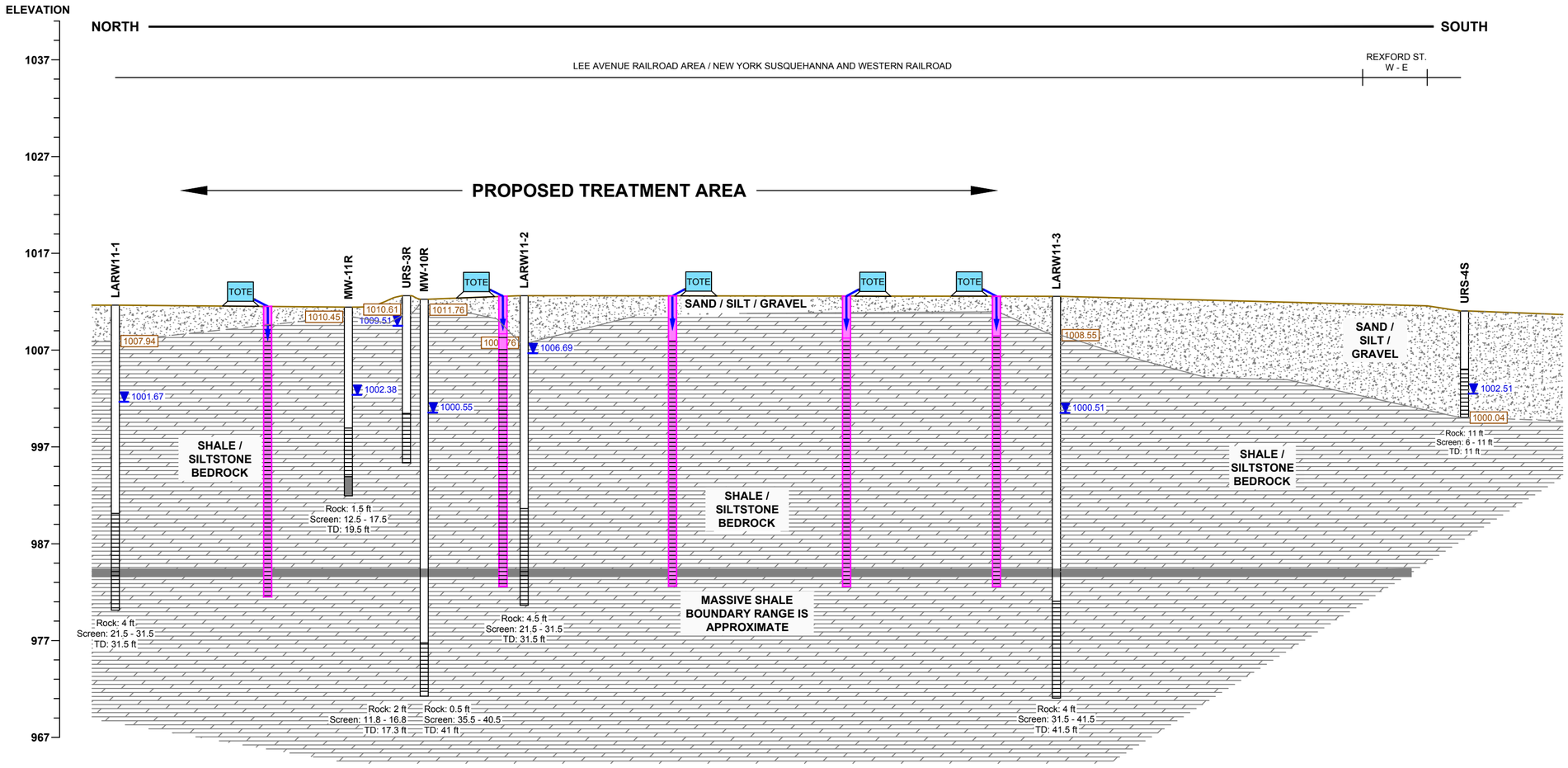
Rev.	Rev. By	Description	Date

LEE AVENUE RAILROAD AREA REMEDIAL ACTION WORK PLAN NORWICH, NEW YORK NYS #709014

FIGURE 2-7 MONITORING WELL NETWORK

Drawn By: MDO	Date Drawn: 08/2017
Review By: MSS	Date Review: 08/2017
Scale: As Shown	Plot Date: 08/2017
Project No.: C00287_2017	Figure 2-7

C:\Users\Mick.Osburn.EHS\Documents\Drawings\Ashland Simmonds Precision\New GIS Data\MXDs\Remedial Action Work Plan Figures\Revised Figures\Figure2-7_Norwich_Monitoring_Well_Network.mxd



DEPTH OF VALLEY FLOOR
SUSPECTED TO BE 700 FEET MSL

LEGEND

0 60 120 180 240 300 360 420 480 540 600 660 720 780 840 900
DISTANCE IN FEET

- WELL RISER
- WELL SCREEN
- SHALE / SILTSTONE
- SAND / SILT / GRAVEL
- CLAY
- GROUNDWATER ELEVATION
- WATER LEVEL
- DASHED WHERE INFERRED
- TD — TOTAL DEPTH IN FEET (ft)
- 1007.94 — BEDROCK ELEVATION (ft)

VERTICAL SCALE
SCALE IN FEET
10
0
10

60 0 60
HORIZONTAL SCALE
SCALE IN FEET

NOTES:

- INJECTION WELL CONSTRUCTION IS CONCEPTUALIZED. SCREEN TO EXTEND FULL LENGTH OF FRACTURED BEDROCK. ADDITIONAL SCREEN LENGTH MAY EXTEND INTO COMPETANT BEDROCK.
- SOIL LITHOLOGY AND MONITORING WELL CONSTRUCTION DETAILS ARE BASED ON SOIL BORING/WELL CONSTRUCTION LOGS AT TIME OF INSTALLATION.
- ELEVATIONS ARE PROVIDED IN FEET ABOVE MEAN SEA LEVEL (MSL).
- GROUNDWATER ELEVATIONS WERE COLLECTED MARCH 7, 2013.

REFERENCE:

REMEDIAL INVESTIGATION REPORT, FIGURE 12 HYDROGEOLOGIC CROSS SECTION E-E', MAY 12, 2014.

EHS Support *consider it done*

REVISIONS				
Rev.		By:	Disc.:	Date:
Rev.		By:	Disc.:	Date:
Rev.		By:	Disc.:	Date:
Rev.		By:	Disc.:	Date:

LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK
NYS #709014

FIGURE 2-8
CONCEPTUALIZED PERCHED ZONE REMEDIAL ACTION AREA

Drawn By:	MDO	Date Drawn:	07/2017
Reviewed By:	MSS	Date Reviewed:	07/2017
Scale:	AS SHOWN	Plot Date:	07/2017
Project Number.: C00287-2017		Figure 2-8	

Legend

- Monitor (Dark Blue)
- Declined (Green)
- Mitigated (Bright Blue)
- NFA (Gray/Opaque)
- Potential Seperate VI Source (Pink)
- Unresponsive (Yellow)
- Vacant (Vg Vacant/Garage)
- V — Tax Parcel
- VI Assessment Recommended (2017-2018)

Notes:
Status determinations based on heating season sampling event through March 2017.

Reference:
Lot and Block data provided by the City of Norwich.
Aerial Image from ESRI User Community dated 09/16/2015.

C:\Users\Mick.Osburn.EHS\Documents\Drawings\Ashland Simmonds Precision\New GIS Data\MXDs\Remedial Action Work Plan Figures\Revised Figures\Figure 2-9_Norwich_SVI_Monitoring_Status_July_2017.mxd

EHS Support *consider it done*

August 2017

Rev.	Rev. By	Description	Date

LEE AVENUE RAILROAD AREA
REMEDIAL ACTION WORK PLAN
NORWICH, NEW YORK
NYS #709014

FIGURE 2-9
SOIL VAPOR INTRUSION STUDY AREA

Drawn By: MDO	Date Drawn: 08/2017
Review By: MSS	Date Review: 08/2017
Scale: As Shown	Plot Date: 08/2017
Project No.: C00287_2017	Figure 2-9

C:\Users\Mick.Osburn.EHSD\Documents\Drawings\Ashland Simmonds Precision\New GIS Data\MXDs\Remedial Action Work Plan Figures\Revised Figures\Figure2-10_Norwich_PropEnvironmentalEasement.mxd

EHS Support *consider it done*

August 2017

FIGURE 2-10
PROPOSED ENVIRONMENTAL EASEMENT AREA
LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK
NYS #709014

FIGURE 3-1
PRELIMINARY REMEDIAL ACTION SCHEDULE
REMEDIAL ACTION WORK PLAN
LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK
NYS #709014

			2017																										2018																	
			Jul-17					Aug-17				Sep-17				Oct-17					Nov-17				Dec-17				Jan-18					Feb-18				Mar-18				Apr-18				
	Action Items	**Date**	3	10	17	24	31	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30
1	**PRAP: Proposed Remedial Action Plan**	02/26/17																																												
	Public Comment Period	02/26/17																																												
	Submit Fact Sheet	03/09/17																																												
2	**Record of Decision**	03/31/17																																												
	Submit Fact Sheet	April 20017																																												
3	**Access Agreement**																																													
	Right of Entry Permit Renewal	06/27/17																																												
4	**Progress Reports (Quarterly)**	Per Order						10th													10th													10th												
5	**Remedial Design/Baseline Sampling**																																													
	Notification (7-days prior to start)	July-17																																												
	Bedrock Verification Sampling	July-17																																												
	Waste Characterization	July-17																																												
	Site Survey	July-17																																												
	Monitoring Well Integrity Inspection	July-17																																												
	Baseline Groundwater Sampling	July-17																																												
	Data Review																																													
		\																																												
6	**Remedial Action Work Plan**																																													
	Submittal							**8th**																																						
	State Review/Comment Period																																													
	Response to Comments																																													
	State Review/Approval																																													
7	**Contractor Procurement**																																													
8	**Remedial Action Implementation**																																													
	Notification/Fact Sheet																																													
	Soil Removal Action																																													
	Groundwater Remedial Action																																													
	Vapor Intrusion Assessment																																													
9	**Site Management Plan Development**																																													
	Institutional and Engineering Plan																																													
	Monitoring Plan																																													
	Inspection and Maintenance Plan																																													
10	**Final Engineering Report Development**																																													

EHS Support
consider it done

APPENDIX A

Record of Decision

RECORD OF DECISION

Lee Ave Railroad Area
State Superfund Project
Norwich, Chenango County
Site No. 709014
March 2017

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

DECLARATION STATEMENT - RECORD OF DECISION

Lee Ave Railroad Area
State Superfund Project
Norwich, Chenango County
Site No. 709014
March 2017

Statement of Purpose and Basis

This document presents the remedy for the Lee Ave Railroad Area site, a Class 2 inactive hazardous waste disposal site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375, and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the Lee Ave Railroad Area site and the public's input to the proposed remedy presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Description of Selected Remedy

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program.

Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- reducing direct and indirect greenhouse gases and other emissions;
- increasing energy efficiency and minimizing use of non-renewable energy;
- conserving and efficiently managing resources and materials;
- reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- maximizing habitat value and creating habitat when possible;

• fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
• integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Excavation

Excavation and off-site disposal of contaminant source areas, including soils which exceed the protection of groundwater soil cleanup objectives (PGWSCOs) as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater above standards. The excavation would not require disturbance of the existing rail line. Approximately 772 cubic yards of contaminated soil will be removed from the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the design grades at the site.

3. In-situ Treatment

In-situ treatment will be implemented to degrade the contaminants in bedrock groundwater. The treatment reagent to be injected into the fractured bedrock will be determined during remedial design and may require additional investigation, laboratory bench scale testing, and a pilot scale study. Commercially available in-situ treatment technologies that appear to be viable for the contaminant and hydrogeologic conditions include: Biostimulation, Bioaugmentation, Biogechemical Reductive Dechlorination (BiRD), and Colloidal Activated Carbon Biomatrix (PlumeStopTM). Conceptually, the lateral extent of treatment will be approximately 61,500 square feet (ft2) and the in-place treatment zone will be approximately 50,000 cubic yards (yd3). Specific injection plan details (e.g., number, locations, and depth of injection points) will be determined during remedial design.

4. Vapor Intrusion

Continue to completion, the soil vapor intrusion evaluation currently underway. The soil vapor intrusion evaluation includes tracking and sampling of monitor locations and previously unresponsive or decline locations, as well as, sampling of additional properties until clear boundaries for the limits of the evaluation area can be determined. The evaluation will also include provisions for implementing actions recommended to address exposures related to soil vapor intrusion, including installation of a sub-slab depressurization system, or a similar engineered system, to mitigate the migration of vapors into the building from groundwater, if warranted.

5. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

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

6. Site Management Plan

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

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

Institutional Controls: The Environmental Easement discussed in remedial element 5 above.

Engineering Controls: The sub-slab depressurizations systems discussed in remedial element 4 above and ROD Section 6.2.

This plan includes, but may not be limited to:
• an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
• descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
• a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed on the site, including provisions for implementing actions recommended to address exposures related to soil vapor intrusion;
• a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed off-site in the area of contamination, including provisions for implementing actions recommended to address exposures related to soil vapor intrusion;
• provisions for the management and inspection of the identified engineering controls;
• maintaining site access controls and Department notification; and
• the steps necessary for the periodic reviews and certification of the institutional and engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
• monitoring groundwater to assess the performance and effectiveness of the remedy and to confirm the protectiveness of the remedy with respect to the shallow public water supply wells (which are currently not in use);
• a schedule of monitoring and frequency of submittals to the Department;

• monitoring for vapor intrusion for any new buildings developed on-site or for any new building developed off-site in the area of contamination, as may be required by the Institutional and Engineering Control Plan discussed above.

c. an Inspection and Maintenance (I&M) Plan to ensure continued inspection, maintenance, and reporting of any mechanical or physical components of the active vapor mitigation systems. The plan includes, but is not limited to:

• procedures for inspecting and maintaining the system(s); and
• compliance inspection of the systems to ensure proper operation and maintenance as well as providing the data for any necessary reporting.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

March 31, 2017
Date

Robert W. Schick, P.E., Director
Division of Environmental Remediation

RECORD OF DECISION

Lee Ave Railroad Area
Norwich, Chenango County
Site No. 709014
March 2017

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of hazardous wastes at this site, as more fully described in this document, has contaminated various environmental media. The remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This Record of Decision (ROD) identifies the selected remedy, summarizes the other alternatives considered, and discusses the reasons for selecting the remedy.

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

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repositories:

Guernsey Memorial Library
3 Court Street
Norwich, NY 13815
Phone: 607-334-4034

NYSDEC Region 7
1679 Route 11
Kirkwood, NY 13795
Phone: 607-775-2545 extension 116

A public meeting was also conducted. At the meeting, the findings of the remedial investigation (RI) and the feasibility study (FS) were presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period was held, during which verbal or written comments were accepted on the proposed remedy.

Comments on the remedy received during the comment period are summarized and addressed in the responsiveness summary section of the ROD.

Receive Site Citizen Participation Information By Email

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

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Lee Avenue Railroad Area site is a three acre parcel within the New York Susquehanna and Western (NYSW) railroad right-of-way (ROW) in the City of Norwich, Chenango County. The site is approximately 1,750 feet west of the Chenango River and less than 0.5 miles north of the city center. The site is adjacent to mixed industrial and residential properties on the east, residential properties on the west, and is bisected north-south by Rexford Avenue (State Route 23).

Site Features: The site is part of a railroad ROW. There is a single rail line aligned generally north-south through the site. Adjacent to the tracks the ground surface is a mix of railroad ballast, other unvegetated coarse fill type material, paved areas, and areas with vegetated cover.

Current Zoning and Land Use: The current zoning is industrial. The Chenango County Industrial Development Authority (CCIDA) is the current site owner of record. The railroad line at this site has been inactive since 2006; however, plans exist to rehabilitate the tracks for reuse.

Past Use of the Site: The rail line in this area dates to pre-1900. It appears that contamination at this site may have occurred through waste disposal actions associated with industrial operations that occurred at the former Lee Avenue Plant, which is adjacent to the northern portion of the site along the east side. The area between the former Lee Avenue Plant and the railroad tracks

appears to have been used by operators at the Plant for disposal. Prior uses at the former Lee Avenue Plant that appear to have led to site contamination include manufacturing of electronics and aircraft engine parts.

Site assessments, environmental investigations, soil remediation and performance monitoring were all conducted for portions of this site by Hercules, Inc. between 1991 and 1997. A preliminary soil vapor intrusion evaluation was conducted by the Department in 2004. Environmental investigations were initially continued by the CCIDA through Department's Environmental Restoration Program (ERP) between 2005 and 2009. Investigations were continued by the Department through the State Superfund Program between 2010 and 2012. Currently, the remedial program is being conducted by Hercules, Inc. through an agreement with the Department.

Site Geology and Hydrogeology: The site is located on the western edge of the Chenango River Valley. This is partially evidenced by outcropping bedrock immediately west of the railroad tracks. Unconsolidated sediments overlying bedrock on-site range from a few inches to approximately 10 feet thick. The unconsolidated sediments on-site generally consist of silty sand with some gravel. The bedrock is comprised of low permeability shale and siltstone. The uppermost 2 to 5 feet of bedrock beneath the site appears to be highly weathered and fractured; beneath this weathered zone the bedrock is more competent with occasional vertical fractures. At the site, groundwater is encountered within the upper weathered and fractured zone. The general direction of groundwater flow is to the east.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

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

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

SECTION 5: ENFORCEMENT STATUS

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

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

Hercules Incorporated (Hercules)

The Department and Hercules Incorporated entered into a Consent Order and Administrative Settlement (Index #R7-0787-12-06) on July 10, 2012. The Order obligates the responsible parties to implement a full remedial program.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

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

The following general activities are conducted during an RI:

- research of historical information;
- geophysical survey to determine the lateral extent of wastes;
- test pits, soil borings, and monitoring well installations;
- sampling of waste, surface and subsurface soils, groundwater, and soil vapor;
- sampling of surface water and sediment; and
- ecological and human health exposure assessments.

The analytical data collected on this site includes data for:

- groundwater
- soil
- indoor air
- sub-slab vapor

6.1.1: Standards, Criteria, and Guidance (SCGs)

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

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

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants

of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data. The contaminants of concern identified at this site are:

1,1-dichloroethane	toluene
1,1 dichloroethene	trichloroethene (TCE)
1,1,1-trichloroethane	trans-1,2-dichloroethene
cis-1,2-dichloroethene (cis-1,2-)	vinyl chloride
tetrachloroethene (PCE)	

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

- groundwater
- soil
- soil vapor intrusion

6.2: Interim Remedial Measures

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

The following IRM has been completed at this site based on conditions observed during the RI.

IRM Soil Vapor Mitigation

Based on soil vapor intrusion sampling results, sub-slab depressurization systems (SSDSs) were installed by Hercules on 24 off-site buildings between 2012 and 2013 to mitigate the migration of vapors from groundwater. As a result of investigations conducted prior to the RI, 45 off-site buildings were mitigated between 2005 and 2011 through the installation of SSDSs. All mitigations systems installed in the off-site buildings were constructed according to the NYSDOH, "Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York", dated October 2006. Based on pressure field testing results and indoor air samples collected after installation of each mitigation system, all systems have been shown to be effectively addressing the potential for soil vapor intrusion. Mitigation systems installed at all 69 buildings have been inspected and maintained by Hercules, pursuant to a Department approved SSDS interim inspection and maintenance work plan dated February 2013.

6.3: Summary of Environmental Assessment

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

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

Nature and Extent of Contamination: Soil and groundwater were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), inorganics, polychlorinated biphenyls (PCBs), and pesticides. Based on investigations conducted to date, the primary contaminants of concern that are site related include VOCs in soil, groundwater, and soil vapor.

Soil – Subsurface soil in the area of disposal on-site has been impacted by VOCs that occur at levels above the soil cleanup objectives (SCOs) for unrestricted use and the protection of groundwater. VOCs that are above their respective SCOs include 1,1,1-trichloroethane (1,1,1-TCA), cis-1,2-dichloroethene (cis-1,2-DCE), tetrachloroethene (PCE), and trichloroethene (TCE). Although these constituents are above soil cleanup objectives (SCOs) for unrestricted use and protection of groundwater they do not exceed the SCOs for industrial use. Additionally, VOCs do not exceed unrestricted SCOs in soil off-site.

Groundwater – Constituents with concentrations above their respective groundwater standard are limited to VOCs only and include 1,1,1-TCA, TCE and their associated breakdown products, as well as, PCE and toluene. Breakdown products for 1,1,1-TCA and TCE together include 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-DCE, trans-1,2-dichloroethene, and vinyl chloride. VOCs in groundwater off-site with concentrations above groundwater standards primarily include cis-1,2-DCE and TCE. Contamination in groundwater has migrated from the disposal area to off-site locations. Groundwater contamination appears to extend approximately 3,500 feet from the site and in the general direction of groundwater flow to the east and southeast.

Soil Vapor and Indoor Air – The primary contaminant of concern in the soil vapor is TCE. The presence of TCE in soil vapor corresponds to the detections of the contaminant in groundwater and they appear to occur in the same general area. No buildings exist on-site; therefore, no on-site soil vapor intrusion evaluation has been necessary. However, off-site vapor intrusion evaluations have been and continue to be conducted by Hercules as part of the overall remedial program. Based on results from previous sampling conducted by the CCIDA and the Department, and from sampling conducted during the remedial investigation, 69 off-site buildings have been mitigated to prevent potential exposures associated with soil vapor intrusion. In addition to the 69 mitigated structures, results from sampling have indicated monitoring or resampling should continue for 25 structures and no further actions are necessary for 72 structures.

Recommended actions to address the potential exposures associated with soil vapor intrusion, have been based on evaluation of indoor air contaminant concentration, sub-slab soil vapor contaminant concentration, and other environmental conditions (e.g., proximity to contaminant source, groundwater contaminant concentration). In some off-site buildings where mitigation was performed the indoor air concentration for TCE was greater that the NYSDOH indoor guideline value of 2 micrograms per cubic meter ($\mu g/m^3$).

6.4: Summary of Human Exposure Pathways

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

People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. People will not come into contact with site-related soil and groundwater contamination unless they dig below the surface. Volatile organic compounds in the groundwater may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. There are no buildings on-site so inhalation of site contaminants in indoor air via vapor intrusion is not a current concern and future concerns are unlikely unless the site is redeveloped. An investigation of soil vapor intrusion is on-going at off-site structures with actions being taken as necessary to address exposures.

6.5: Summary of the Remediation Objectives

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

The remedial action objectives for this site are:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

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

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

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

The selected remedy is referred to as the Limited Excavation and In-situ Treatment of Bedrock Groundwater remedy.

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program.

Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- reducing direct and indirect greenhouse gases and other emissions;
- increasing energy efficiency and minimizing use of non-renewable energy;
- conserving and efficiently managing resources and materials;

• reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
• maximizing habitat value and creating habitat when possible;
• fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
• integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Excavation

Excavation and off-site disposal of contaminant source areas, including soils which exceed the protection of groundwater soil cleanup objectives (PGWSCOs) as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater above standards. The excavation would not require disturbance of the existing rail line. Approximately 772 cubic yards of contaminated soil will be removed from the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the design grades at the site.

3. In-situ Treatment

In-situ treatment will be implemented to degrade the contaminants in bedrock groundwater. The treatment reagent to be injected into the fractured bedrock will be determined during remedial design and may require additional investigation, laboratory bench scale testing, and a pilot scale study. Commercially available in-situ treatment technologies that appear to be viable for the contaminant and hydrogeologic conditions include: Biostimulation, Bioaugmentation, Biogechemical Reductive Dechlorination (BiRD), and Colloidal Activated Carbon Biomatrix (PlumeStopTM). Conceptually, the lateral extent of treatment will be approximately 61,500 square feet (ft2) and the in-place treatment zone will be approximately 50,000 cubic yards (yd3). Specific injection plan details (e.g., number, locations, and depth of injection points) will be determined during remedial design.

4. Vapor Intrusion

Continue to completion, the soil vapor intrusion evaluation currently underway. The soil vapor intrusion evaluation includes tracking and sampling of monitor locations and previously unresponsive or decline locations, as well as, sampling of additional properties until clear boundaries for the limits of the evaluation area can be determined. The evaluation will also include provisions for implementing actions recommended to address exposures related to soil vapor intrusion, including installation of a sub-slab depressurization system, or a similar engineered system, to mitigate the migration of vapors into the building from groundwater, if warranted.

5. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

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

6. Site Management Plan

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

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

Institutional Controls: The Environmental Easement discussed in remedial element 5 above.

Engineering Controls: The sub-slab depressurizations systems discussed in remedial element 4 and Section 6.2 above.

This plan includes, but may not be limited to:
• an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
• descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
• a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed on the site, including provisions for implementing actions recommended to address exposures related to soil vapor intrusion;
• a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed off-site in the area of contamination, including provisions for implementing actions recommended to address exposures related to soil vapor intrusion;
• provisions for the management and inspection of the identified engineering controls;
• maintaining site access controls and Department notification; and
• the steps necessary for the periodic reviews and certification of the institutional and engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
• monitoring groundwater to assess the performance and effectiveness of the remedy and to confirm the protectiveness of the remedy with respect to the shallow public water supply wells (which are currently not in use);
• a schedule of monitoring and frequency of submittals to the Department;

• monitoring for vapor intrusion for any new buildings developed on-site or for any new building developed off-site in the area of contamination, as may be required by the Institutional and Engineering Control Plan discussed above.

c. an Inspection and Maintenance (I&M) Plan to ensure continued inspection, maintenance, and reporting of any mechanical or physical components of the active vapor mitigation systems. The plan includes, but is not limited to:

• procedures for inspecting and maintaining the system(s); and

• compliance inspection of the systems to ensure proper operation and maintenance as well as providing the data for any necessary reporting.

Exhibit A

Nature and Extent of Contamination

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

For each medium for which contamination was identified, a table summarizes the findings of the investigation. The tables present the range of contamination found at the site in the media and compares the data with the applicable SCGs for the site. The contaminants are arranged into categories depending on what constituents were detected in each medium sampled. For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use. For soil, if applicable, the Restricted Use SCGs identified in Section 4 and Section 6.1.1 are also presented.

Groundwater

Groundwater samples were collected from bedrock using monitoring wells and groundwater samples were collected from overburden using temporary sampling points and monitoring wells. As detailed in the RI, earlier investigations of groundwater at the site have identified site related contaminants of concern to be limited to volatile organic compounds (VOCs). Specifically, previous groundwater sampling results indicated presence of trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), and their associated breakdown products. Groundwater sampling conducted for the RI focused on additional sampling of VOCs to further evaluate the nature and extent of these contaminants on- and off-site.

Due to the location of the site along the bedrock valley wall, the bedrock monitoring wells are located mostly on-site or near to the site boundaries. The overburden temporary sampling points and monitoring wells are mostly located off-site. As depicted in Tables 1A and 1B, the distinction between on-site and off-site is important for understanding the differences in groundwater contaminant conditions with regard to the changes in location and the hydrogeologic units in which groundwater exists (i.e., bedrock versus overburden).

Table 1A – Groundwater in Bedrock (depicts mostly conditions On-Site)

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
1,1-Dichloroethane	ND[c] – 1,500	5	7 of 19
1,1-Dichloroethene	ND – 350	5	6 of 19
1,1,1-Trichloroethane	ND – 1,100	5	5 of 19
Cis-1,2-Dichloroethene	ND – 16,000	5	8 of 19
Tetrachloroethene	ND – 270	5	3 of 19
Toluene	ND – 470	5	4 of 19
Trans-1,2-Dichloroethene	ND – 67	5	2 of 19
Trichloroethene	ND – 70,000	5	8 of 19

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
Vinyl Chloride	ND – 420	2	6 of 19

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b - SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).
c – ND: compound was not detected.

The primary contaminants of concern on-site include: TCE, 1,1,1-TCA and their associated breakdown products, as well as, tetrachloroethene (PCE), and toluene. Breakdown products of TCE detected at the site include cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene (1,1-DCE), tran-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride. Breakdown products of 1,1,1-TCA detected at the site include 1,1-dichloroethane, 1,1-DCE and vinyl chloride. As indicated, some breakdown products for TCE and 1,1,1-TCA are the same.

The primary contaminants of concern are associated with disposals of spent solvents in the area of the site between the railroad tracks and the former Lee Avenue Plant. The concentrations and distribution of the contaminants in groundwater are shown on Figure 2.

Detections of contaminants in groundwater on-site are localized to groundwater within the shallow fractured bedrock. Groundwater samples collected from below the shallow fractured bedrock zone do not show detections of contamination.

Contamination off-site, in areas hydraulically downgradient and generally to the east, are all within the overburden groundwater.

Table 1B – Groundwater in Overburden (depicts mostly conditions Off-Site)

Detected Constituents	Concentration Range Detected (ppb)	SCG (ppb)	Frequency Exceeding SCG
VOCs			
Cis-1,2-Dichloroethene	ND – 32	5	20 of 109
Tetrachloroethene	ND – 14	5	1 of 109
Trichloroethene	ND – 200	5	51 of 109

The primary contaminants of concern off-site are TCE and cis-1,2-DCE. These contaminants are also associated with disposals of spent solvents on-site. As indicated in Table 1B, detections of TCE occurs more frequently and it is more wide-spread within the overburden groundwater. Figure 3 shows the distribution of TCE within the investigation area. TCE has been detected in overburden groundwater monitoring wells located up to approximately 3,250 feet southeast of the site. Portions of the TCE contaminant plume in the overburden groundwater appear to extend to the Chenango River.

Two out-of-service public water supply wells located within 200 feet of the east bank of the Chenango River were sampled and have no detections of contaminants.

Due to poor or incomplete hydraulic connection, it does not appear that the contamination in the shallow fractured bedrock groundwater acts as a continued source of contamination to the overburden groundwater off-site. This conceptualization is supported by the distribution of TCE shown on Figure 3.

Based on the findings of the RI, the past disposal of hazardous waste has resulted in the contamination of groundwater in shallow fractured bedrock on-site and near the site boundaries, and groundwater in overburden off-site. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: TCE, 1,1,1-TCA and their breakdown products, as well as, PCE, and toluene.

Soil

Soil samples were collected at the site during the RI to assess human exposures to soil contamination and potential impacts to groundwater. Soil samples were collected through use of direct-push boring methods and were mostly from 0-6 inches below either vegetative cover, weathered pavement material, or the crushed stone used as railroad ballast. Thickness of soil overlying bedrock ranges from several inches to a few feet over much of the site area located north of Rexford Street. Soil thickness increases in the area south of Rexford Street and samples were collected down to 9.5 feet below ground surface (bgs). Sampling results indicate that VOCs, one semi-volatile organic constituent, and one inorganic constituent exceed the unrestricted use SCGs and the applicable restricted use SCGs. Table 2 summarizes exceedances of SCGs and provides information for the applicable restricted use SCGs used. Soil samples collected off-site as part of the RI were analyzed for VOCs only and ranged in depth from 0 to 11 feet bgs. Off-site sampling results indicate no exceedances of unrestricted use SCGs for VOCs.

Table 2 - Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Use SCG[c] (ppm)	Frequency Exceeding Restricted SCG
VOCs					
1,1,1-Trichloroethane	ND[e] – 1.8	0.68	2 of 6	0.68[d]	2 of 6
cis-1,2-Dichloroethene	ND – 0.57 J[f]	0.25	1 of 6	0.25[d]	1 of 6
Acetone	ND – 0.67 J	0.05	2 of 6	1,000	0 of 6
Methylene Chloride	ND – 0.67 J	0.05	2 of 6	1,000	0 of 6
m,p-Xylenes	ND – 0.28	0.26	1 of 6	1,000	0 of 6
Tetracholorethene	ND – 13	1.3	4 of 6	1.3[d]	4 of 6
Trichloroethene	ND – 50	0.47	4 of 6	0.47[d]	4 of 6
SVOCs					
Benzo(a)anthracene	0.5 – 3.6 J	1	4 of 5	11	0 of 5
Benzo(a)pyrene	0.56 – 2.8	1	4 of 5	1.1	4 of 5
Benzo(b)fluoranthene	ND – 4.4	1	4 of 5	11	0 of 5
Benzo(k)fluoranthene	1.1 - 3	0.8	5 of 5	110	0 of 5

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Use SCG[c] (ppm)	Frequency Exceeding Restricted SCG
Chrysene	0.64 – 3.9 J	1	4 of 5	110	0 of 5
Dibenz(a,h)anthracene	0.099 J – 0.6 J	0.33	2 of 5	1.1	0 of 5
Indeno(1,2,3-cd)pyrene	0.32 J – 1.7	0.5	4 of 5	11	0 of 5
Inorganics					
Arsenic	7.2 – 41.8	13	2 of 5	16	2 of 5
Cadmium	1.4 – 20.7 J	2.5	2 of 5	60	0 of 5
Chromium	14.2 – 23.7 J	1	5 of 5	800	0 of 5
Copper	43.8 - 263	50	4 of 5	10,000	0 of 5
Lead	49.2 - 240	63	4 of 5	3,900	0 of 5
Mercury	0.098 – 0.93	0.18	2 of 5	5.7	0 of 5
Nickel	20.7 – 164 J	30	3 of 5	10,000	0 of 5
Silver	ND – 75.7 J	2	3 of 5	6,800	0 of 5
Zinc	93.1 - 410	109	4 of 5	10,000	0 of 5
Pesticides/PCBs					
4,4’-DDD	ND – 0.0056 J	0.0033	3 of 5	180	0 of 5
4,4’-DDE	ND – 0.018 J	0.0033	4 of 5	120	0 of 5
4,4’-DDT	0.0043 – 0.058 J	0.0033	5 of 5	94	0 of 5

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.
c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Public Health for Industrial Use, unless otherwise noted.
d - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Groundwater.
e – ND: compound was not detected.
f – J: reported value was obtained from a reading that was less than the quantification limit, but greater than the method detection limit.

The primary soil contaminants are VOCs associated with the former disposal of spent solvents on-site. VOCs including 1,1,1-TCA, cis-1,2-DCE, PCE, and TCE were detected at concentrations greater than both the unrestricted use and restricted use SCGs. Each of these constituents were detected in at least some of the investigation groundwater samples. Figure 4 shows a compilation of soil sampling conducted for the RI and sampling conducted by the Department prior to the start of work by Hercules. The soil results shown together provides a better definition for the distribution of VOCs in soil. Combined results indicate no exceedances of unrestricted use SCGs for VOCs on-site in the area south of Rexford Street and in off-site areas.

Benzo(a)pyrene was the only SVOC detected at concentrations greater than the unrestricted use and restricted use SCGs. Detections of benzo(a)pyrene occurred in soil samples collected adjacent to the railroad tracks, beneath

the railroad ballast, and are likely associated with railway use and SVOC migration from creosote-treated railway ties. Therefore, benzo(a)pyrene will not be considered a site specific contaminant of concern.

Arsenic was the only inorganic detected at concentrations greater than unrestricted use and restricted use SCGs. Detections of arsenic occurred in soil samples on the north and south side of Rexford Street along the railroad tracks and beneath railroad ballast. Although arsenic is naturally occurring the detections may also be attributed to construction materials used in the roadway or railway crossing. Therefore, arsenic will not be considered a site specific contaminant of concern.

Based on the findings of the Remedial Investigation, the past disposal of hazardous waste has resulted in the contamination of soil. The site contaminants identified in soil which are considered to be the primary contaminants of concern, to be addressed by the remedy selection process are 1,1,1-TCA, cis-1,2-DCE, PCE, and TCE.

Soil Vapor

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related groundwater contamination was evaluated by the sampling of sub-slab soil vapor under structures, and indoor air inside structures. Due to the presence of buildings in the impacted area off-site, a full suite of samples were collected to evaluate whether actions are needed to address exposures related to soil vapor intrusion.

As part of the RI, soil vapor intrusion sampling (i.e., collecting combined sample sets of sub-slab, indoor, and outdoor air) has been conducted at 56 off-site structures. The results indicate detections of TCE in sub-slab vapor at some structures and in the indoor air at some structures. In sub-slab vapor and in indoor air, TCE has been detected at maximum concentrations of 110 and 1 $\mu g/m^3$, respectively. Detections of TCE in sub-slab and indoor air are consistent with detections of TCE in overburden groundwater off-site.

Based on the sampling results, mitigations systems (i.e., sub-slab depressurization systems) were installed at eight of the 56 structures. Prior to the start of soil vapor intrusion sampling for the RI, Hercules installed mitigation systems at 16 structures that had previously been sampled by the Department in conjunction with NYSDOH.

Soil vapor intrusion evaluations conducted with oversight by the Department and NYSDOH prior to the RI resulted in the installation of mitigation systems at 45 structures. Therefore, since 2004, the total number of structures with mitigation systems in the off-site area is 69. Inspections of the previously installed mitigation systems has been conducted as part of the RI and all systems are included within an interim inspection and maintenance program implemented by Hercules.

Overall, soil vapor intrusion evaluations for the off-site area have included offers to sample at 252 properties. Of the 252 properties, 166 have been sampled. Unsampled properties include 67 where owners have been unresponsive to offers for sampling and 19 where owners have declined offers for sampling.

In addition to the 69 structures that have been mitigated, results from sampling have indicated monitoring should continue for 25 structures and no further actions are necessary for 72 structures. The soil vapor intrusion evaluation for structures within the off-site area is considered to be incomplete and will be continued by Hercules as part of the remedial program.

Recommended actions to address the potential exposures associated with soil vapor intrusion, have been based on evaluation of indoor air contaminant concentration, sub-slab soil vapor contaminant concentration, and other environmental conditions (e.g., proximity to contaminant source, groundwater contaminant concentration). In some off-site buildings where mitigation was performed the indoor air concentration for TCE was greater that the NYSDOH indoor guideline value of 2 $\mu g/m^3$.

Based on the findings of the Remedial Investigation, the disposal of hazardous waste has resulted in the contamination of soil vapor. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of soil vapor to be addressed by the remedy selection process are, TCE.

Exhibit B

Description of Remedial Alternatives

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

Alternative 1: No Further Action

The No Further Action Alternative recognizes the remediation of the site completed by the IRM(s) described in Section 6.2This alternative leaves the site in its present condition and does not provide any additional protection of the environment.

Alternatives 2, 3, and 4 include the following common elements.

Common Element 1 – Soil Vapor Intrusion Evaluation

Soil vapor intrusion evaluation will be continued to determine the limits of the area where actions are needed to address exposures related to soil vapor intrusion and to provide monitoring, as necessary. Based on current soil vapor intrusion sampling results, the limits for where actions are needed to address exposures related to soil vapor intrusion is not defined, particularly in areas to the southeast within the investigation area. Sampling will be offered to homes in this area and in other areas identified by the Department and NYSDOH. New sampling may include approximately 40 buildings. Additionally, 20 building owners have declined previous offers for sampling, 67 building owners have been unresponsive to previous offers for sampling, and 27 buildings have had results that indicated monitoring is recommended. Sampling of buildings in the decline and unresponsive categories will be provided when requested by the building owner. Sampling of buildings in the monitor category will continue to be offered until a decision for mitigation or no further action is determined by the NYSDOH. Mitigation of buildings will be performed as warranted, based on soil vapor intrusion sampling results and pursuant to NYSDOH recommendations. Overall, it is anticipated that the soil vapor intrusion evaluation work will continue for 5 years following remedy selection.

Present Worth: *$494,000*
Capital Cost: *$6,600*
Annual Costs: *$113,000*

Common Element 2 – Institutional Controls and Site Management Plan

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

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

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

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

   Institutional Controls: The Environmental Easement detailed above.

   Engineering Controls: The sub-slab depressurizations systems installed on all buildings off-site.

   This plan includes, but may not be limited to:
   - an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
   - descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
   - a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed on the site, including provisions for implementing actions recommended to address exposures related to soil vapor intrusion;
   - a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed off-site in the area of contamination, including provisions for implementing actions recommended to address exposures related to soil vapor intrusion;
   - provisions for the management and inspection of the identified engineering controls;
   - maintaining site access controls and Department notification; and
   - the steps necessary for the periodic reviews and certification of the institutional and engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
   - monitoring groundwater to assess the performance and effectiveness of the remedy and to confirm the protectiveness of the remedy with respect to the shallow public water supply wells (which are currently not in use);
   - a schedule of monitoring and frequency of submittals to the Department;
   - monitoring for vapor intrusion for any new buildings developed on-site or for any new buildings developed off-site in the area of contamination, as may be required by the Institutional and Engineering Control Plan discussed above.

c. an Inspection and Maintenance (I&M) Plan to ensure continued inspection, maintenance, and reporting of any mechanical or physical components of the active vapor mitigation systems. The plan includes, but is not limited to:
   - procedures for inspecting and maintaining the system(s); and
   - compliance inspection of the systems to ensure proper operation and maintenance as well as providing the data for any necessary reporting.

For cost estimates, it was considered that the monitoring of overburden groundwater would continue for five years and the inspection and maintenance of the mitigation systems would continue for 30 years. However, it is

anticipated that the requirement for mitigation and the need for continued inspection and maintenance would be assessed 10 years after implementation of the selected remedy.

Present Worth: *$872,000*
Capital Cost: *$39,600*
Annual Costs: *$54,200*

Alternative 2 – Limited Excavation and Monitored Natural Attenuation

For the limited excavation, the on-site soils with site-related contaminants of concern which exceed the protection of groundwater SCOs, as defined in 6 NYCRR Part 375-6.8, will be excavated and transported off-site for disposal. The excavation would not require disturbance of the existing rail line. Approximately 772 cubic yards of contaminated soil will be removed from the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the design grades at the site.

Bedrock groundwater contamination will be addressed with monitored natural attenuation (MNA). Groundwater will be monitored for site related contamination and also for MNA indicators which will provide an understanding of the natural processes breaking down the contamination. Reports of the attenuation will be provided at 5 years, and a contingency active remediation will be proposed if it appears that natural processes alone will not address the contamination.

Present Worth: *$274,000*
Capital Cost: *$190,000*
Annual Costs: *$84,300*

Alternative 3 – Limited Excavation and In-situ Treatment of Bedrock Groundwater

For the limited excavation, the on-site soils with site-related contaminants of concern which exceed the protection of groundwater SCOs, as defined in 6 NYCRR Part 375-6.8, will be excavated and transported off-site for disposal. The excavation would not require disturbance of the existing rail line. Approximately 772 cubic yards of contaminated soil will be removed from the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the design grades at the site.

In-situ treatment will be implemented to degrade the contaminants in bedrock groundwater. The treatment reagent to be injected into the fractured bedrock will be determined during remedial design and may require additional investigation, laboratory bench scale testing, and a pilot scale study. Commercially available in-situ treatment technologies that appear to be viable for the contaminant and hydrogeologic conditions include: Biostimulation, Bioaugmentation, Biogechemical Reductive Dechlorination (BiRD), and Colloidal Activated Carbon Biomatrix (PlumeStop^{TM}). Conceptually, the lateral extent of treatment will be approximately 61,500 square feet (ft^2) and the in-place treatment zone will be approximately 50,000 cubic yards (yd^3). Specific injection plan details (e.g., number, locations, and depth of injection points) will be determined during remedial design.

Present Worth: *$475,000*
Capital Cost: *$391,000*
Annual Costs: *$84,300*

Alternative 4 – Full Excavation and In-situ Treatment of Bedrock Groundwater

For the full excavation, all on-site soils which exceed unrestricted SCOs, as defined in 6 NYCRR Part 375-6.8, will be excavated and transported off-site for disposal. The full excavation will require removal and replacement of the rail line on-site, tree clearing and grubbing in areas west of the rail line, and monitoring well abandonment. Approximately 6,197 cubic yards of soil will be removed from the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the design grades at the site.

In-situ treatment will be implemented to degrade the contaminants in bedrock groundwater. The treatment reagent to be injected into the fractured bedrock will be determined during remedial design and may require additional investigation, laboratory bench scale testing, and a pilot scale study. Commercially available in-situ treatment technologies that appear to be viable for the contaminant and hydrogeologic conditions include: Biostimulation, Bioaugmentation, Biogechemical Reductive Dechlorination (BiRD), and Colloidal Activated Carbon Biomatrix (PlumeStop^{TM}). Conceptually, the lateral extent of treatment will be approximately 61,500 square feet (ft^2) and the in-place treatment zone will be approximately 50,000 cubic yards (yd^3). Specific injection plan details (e.g., number, locations, and depth of injection points) will be determined during remedial design.

Present Worth: *$2,900,000*
Capital Cost: *$2,810,000*
Annual Costs: *$84,300*

Exhibit C

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
Alternative 1 - No Action	0	0	0
Alternative 2 - Limited Excavation and Monitored Natural Attenuation	236,000	252,000	1,640,000
Alternative 3 - Limited Excavation and In-situ Treatment of Bedrock Groundwater	437,000	252,000	1,840,000
Alternative 4 - Full Excavation and In-situ Treatment of Bedrock Groundwater	2,860,000	252,000	4,270,000

Costs shown for Alternatives 2, 3, and 4 each include the costs for Comment Elements 1 and 2 as described in Exhibit B.

Exhibit D

SUMMARY OF THE SELECTED REMEDY

The Department is selecting Alternative 3, Limited Excavation and In-situ Treatment of Bedrock Groundwater as the remedy for this site. Alternative 3 would achieve the remediation goals for the site by removing areas of soil with site related contamination contributing to groundwater, treating bedrock groundwater to expedite degradation of contamination, and preventing exposure to remaining contamination through institutional and engineering controls. The elements of this remedy are described in Section 7. The selected remedy is depicted in Figure 5.

Basis for Selection

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

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

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

The selected remedy (Alternative 3 – Limited Excavation and In-situ Treatment of Bedrock Groundwater) satisfies this criterion by removing areas of soil contamination, which are sources or potential sources of groundwater contamination, and by preventing exposures to contamination through institutional and engineering controls, namely the environmental easement, Site Management Plan, and soil vapor mitigation systems.

Alternative 1 (No Further Action) does not provide any additional protection to public health and the environment, and will not be evaluated further.

Alternative 2 (Limited Excavation and Monitored Natural Attenuation) complies with this threshold criterion, but perhaps to a lesser degree or with a lower certainty than Alternative 3 due to the lack of active remediation of groundwater.

Alternative 4 (Full Excavation and In-situ Treatment of Bedrock Groundwater) meets this threshold criterion.

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

Alternative 3 complies with SCGs to the extent practicable. SCGs are achieved for soil through excavation. The soil removal and in-situ treatment of groundwater also create conditions necessary to restore groundwater quality to the extent practicable and therefore improve conditions related to soil vapor intrusion. Alternative 4 would achieve the SCGs to the same degree and certainty as Alternative 3. Alternative 2 is likely to comply with this criterion, but to a lesser degree or with lower certainty.

Because Alternatives 2, 3, and 4 satisfy the threshold criteria, the remaining criteria are particularly important in selecting a final remedy for the site. The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

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

Alternatives 2, 3, and 4 all include excavation of contaminated soil which is a potential continued source of contamination to groundwater. The full excavation of soil exceeding unrestricted use SCOs included in Alternative 4 does go further by removing the need for property use restrictions. However, it should be noted that the site occupies a portion of a railroad right-of-way and this is the foreseeable future use.

The in-situ treatment of groundwater included in Alternatives 3 and 4 have a greater potential for degradation of bedrock groundwater contamination. Alternative 2 would likely require longer duration groundwater monitoring and may include a change to in-situ treatment as a contingency remedial action if monitored natural attenuation proves to be ineffective. Alternatives 2, 3, and 4 would likely require long-term groundwater use restrictions.

Alternatives 3 and 4 appear to be equivalent in the degree to which they will reduce the potential for soil vapor intrusion. With Alternative 2 there is less certainty for reducing the potential for soil vapor intrusion. Engineering and Institutional controls for soil vapor intrusion are equivalent for each Alternative and provide long-term protection of public health.

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

Alternative 3 and 4 provide the greatest reduction in site related contaminant toxicity, mobility and volume through soil removal and in-situ treatment of bedrock groundwater. However, Alternative 4 includes the removal of significantly greater soil volume with no apparent increased benefit to the reduction of toxicity, mobility or volume of waste as compared to Alternative 3. Alternative 2 provides less reduction of toxicity, mobility or volume of waste than Alternative 3 or 4 due to the lack of active groundwater remediation.

5. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternatives 2, 3, and 4 all share short-term adverse impacts related to the construction type activities required for implementation (e.g., increased noise and traffic, and potential for dust and runoff). However, Alternative 4 has greater short-term adverse impacts that include a larger area of ground disturbance, removal of trees and vegetation, and removal and restoration of the rail line on-site. Additionally, the implementation of Alternative 4 will require much more energy input and therefore results in greater greenhouse gas (GHG) emissions.

Typical controls used during construction activities will be in place during implementation of the remedy to minimize short-term impacts.

The estimated time to achieve the remediation goals is shortest with Alternative 3. Alternative 4 adds time to achieve the remediation goals due to additional construction and Alternative 2 is estimated to take the longest time due to the lack of active groundwater remediation.

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

Alternative 2 and 3 are favorable in that they are readily implementable. Alternative 4 has uncertainty in its implementability associated with the removal and reconstruction of the rail line on site, the additional ground disturbances with the railroad right-of-way, and removal of soil near essential utilities.

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

Alternative 2 has the lowest estimated costs due to the lack of active groundwater remediation. Alternative 4 has the highest estimated costs due to the greater capital costs associated with greater volume of excavated soil and replacement with clean backfill, and the removal and replacement of the rail line on site. Alternative 3 has substantially less costs than Alternative 4, yet appears to provide equal protection, compliance, effectiveness, and reduction of contamination with less short-term adverse impacts.

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

The site is entirely with the railroad right-of-way and is considered industrial use. Alternatives 2, 3, and 4 are all suitable for this use designation. Alternatives 2 and 3 allow for non-site-related contaminants to remain in soil beneath the existing railroad ballast material; these conditions would be controllable with the implementation of a Site Management Plan. Alternative 4 would not require restrictions on the site land use; however, the implementation is likely infeasible and may be unnecessary due to the foreseeable future use as a railroad.

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

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

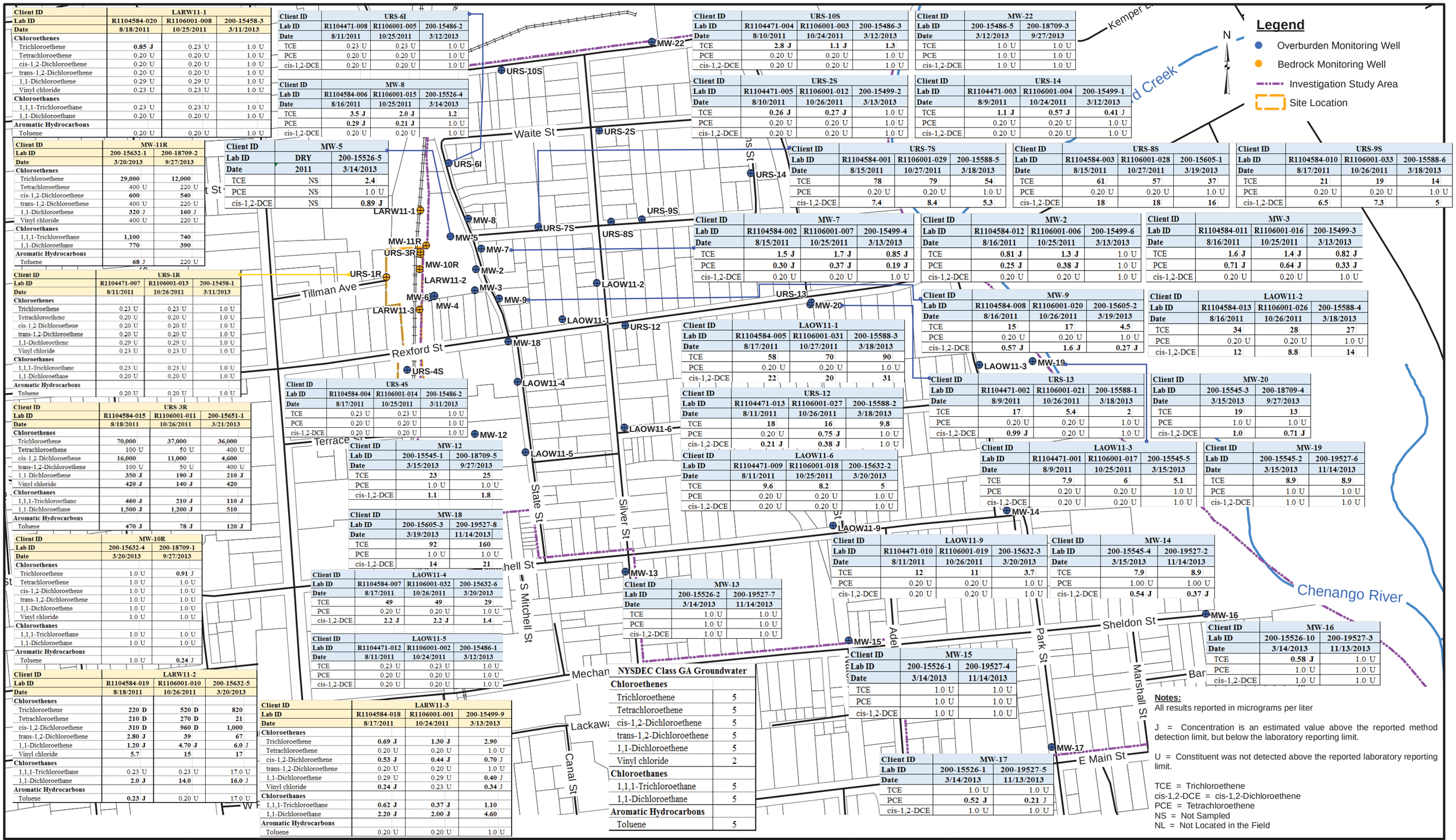
Alternative 3 is being selected because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.

EHS Support
consider it done

Dec. 2014

FIGURE 1
AERIAL SITE PLAN
LEE AVENUE RAILROAD AREA
NYS #709014
NORWICH, NEW YORK

Modified 01/2017 by GWP for use by the Department



Client ID	LARW11-1		
Lab ID	R1104584-020	R1106001-008	200-15458-3
Date	8/18/2011	10/25/2011	3/11/2013
Chloroethenes			
Trichloroethene	0.85 J	0.23 U	1.0 U
Tetrachloroethene	0.20 U	0.20 U	1.0 U
cis-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
trans-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
1,1-Dichloroethene	0.29 U	0.29 U	1.0 U
Vinyl chloride	0.23 U	0.23 U	1.0 U
Chloroethanes			
1,1,1-Trichloroethane	0.23 U	0.23 U	1.0 U
1,1-Dichloroethane	0.20 U	0.20 U	1.0 U
Aromatic Hydrocarbons			
Toluene	0.20 U	0.20 U	1.0 U

Client ID	URS-6I		
Lab ID	R1104471-008	R1106001-005	200-15486-2
Date	8/11/2011	10/25/2011	3/12/2013
TCE	0.23 U	0.23 U	1.0 U
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-8		
Lab ID	R1104584-006	R1106001-015	200-15526-4
Date	8/16/2011	10/25/2011	3/14/2013
TCE	3.5 J	2.0 J	1.2
PCE	0.29 J	0.21 J	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	URS-10S		
Lab ID	R1104471-004	R1106001-003	200-15486-3
Date	8/10/2011	10/24/2011	3/12/2013
TCE	2.8 J	1.1 J	1.3
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-22		
Lab ID	200-15486-5	200-18709-3	
Date	3/12/2013	9/27/2013	
TCE	1.0 U	1.0 U	
PCE	1.0 U	1.0 U	
cis-1,2-DCE	1.0 U	1.0 U	

Client ID	URS-2S		
Lab ID	R1104471-005	R1106001-012	200-15499-2
Date	8/10/2011	10/26/2011	3/13/2013
TCE	0.26 J	0.27 J	1.0 U
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	URS-14		
Lab ID	R1104471-003	R1106001-004	200-15499-1
Date	8/9/2011	10/24/2011	3/12/2013
TCE	1.1 J	0.57 J	0.41 J
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-11R		
Lab ID	200-15632-1	200-18709-2	
Date	3/20/2013	9/27/2013	
Chloroethenes			
Trichloroethene	29,000	12,000	
Tetrachloroethene	400 U	220 U	
cis-1,2-Dichloroethene	600	540	
trans-1,2-Dichloroethene	400 U	220 U	
1,1-Dichloroethene	320 J	160 J	
Vinyl chloride	400 U	220 U	
Chloroethanes			
1,1,1-Trichloroethane	1,100	740	
1,1-Dichloroethane	770	390	
Aromatic Hydrocarbons			
Toluene	68 J	220 U	

Client ID	MW-5		
Lab ID	DRY	200-15526-5	
Date	2011	3/14/2013	
TCE	NS	2.4	
PCE	NS	1.0 U	
cis-1,2-DCE	NS	0.89 J	

Client ID	URS-7S		
Lab ID	R1104584-001	R1106001-029	200-15588-5
Date	8/15/2011	10/27/2011	3/18/2013
TCE	78	79	54
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	7.4	8.4	5.3

Client ID	URS-8S		
Lab ID	R1104584-003	R1106001-028	200-15605-1
Date	8/15/2011	10/27/2011	3/19/2013
TCE	61	57	37
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	18	18	16

Client ID	URS-9S		
Lab ID	R1104584-010	R1106001-033	200-15588-6
Date	8/17/2011	10/26/2011	3/18/2013
TCE	21	19	14
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	6.5	7.3	5

Client ID	URS-1R		
Lab ID	R1104471-007	R1106001-013	200-15458-1
Date	8/11/2011	10/26/2011	3/11/2013
Chloroethenes			
Trichloroethene	0.23 U	0.23 U	1.0 U
Tetrachloroethene	0.20 U	0.20 U	1.0 U
cis-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
trans-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
1,1-Dichloroethene	0.29 U	0.29 U	1.0 U
Vinyl chloride	0.23 U	0.23 U	1.0 U
Chloroethanes			
1,1,1-Trichloroethane	0.23 U	0.23 U	1.0 U
1,1-Dichloroethane	0.20 U	0.20 U	1.0 U
Aromatic Hydrocarbons			
Toluene	0.20 U	0.20 U	1.0 U

Client ID	MW-7		
Lab ID	R1104584-002	R1106001-007	200-15499-4
Date	8/15/2011	10/25/2011	3/13/2013
TCE	1.5 J	1.7 J	0.85 J
PCE	0.30 J	0.37 J	0.19 J
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-2		
Lab ID	R1104584-012	R1106001-006	200-15499-6
Date	8/16/2011	10/25/2011	3/13/2013
TCE	0.81 J	1.3 J	1.0 U
PCE	0.25 J	0.38 J	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-3		
Lab ID	R1104584-011	R1106001-016	200-15499-3
Date	8/16/2011	10/25/2011	3/13/2013
TCE	1.6 J	1.4 J	0.82 J
PCE	0.71 J	0.64 J	0.33 J
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-9		
Lab ID	R1104584-008	R1106001-020	200-15605-2
Date	8/16/2011	10/26/2011	3/19/2013
TCE	15	17	4.5
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.57 J	1.6 J	0.27 J

Client ID	LAOW11-2		
Lab ID	R1104584-013	R1106001-026	200-15588-4
Date	8/16/2011	10/26/2011	3/18/2013
TCE	34	28	27
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	12	8.8	14

Client ID	URS-3R		
Lab ID	R1104584-015	R1106001-011	200-15651-1
Date	8/18/2011	10/26/2011	3/21/2013
Chloroethenes			
Trichloroethene	70,000	37,000	36,000
Tetrachloroethene	100 U	50 U	400 U
cis-1,2-Dichloroethene	16,000	11,000	4,600
trans-1,2-Dichloroethene	100 U	50 U	400 U
1,1-Dichloroethene	350 J	190 J	210 J
Vinyl chloride	420 J	140 J	420
Chloroethanes			
1,1,1-Trichloroethane	460 J	210 J	110 J
1,1-Dichloroethane	1,500 J	1,200 J	510
Aromatic Hydrocarbons			
Toluene	470 J	78 J	120 J

Client ID	URS-4S		
Lab ID	R1104584-004	R1106001-014	200-15486-2
Date	8/17/2011	10/25/2011	3/11/2013
TCE	0.23 U	0.23 U	1.0 U
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	LAOW11-1		
Lab ID	R1104584-005	R1106001-031	200-15588-3
Date	8/17/2011	10/27/2011	3/18/2013
TCE	58	70	90
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	22	20	31

Client ID	URS-13		
Lab ID	R1104471-002	R1106001-021	200-15588-1
Date	8/9/2011	10/26/2011	3/18/2013
TCE	17	5.4	2
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.99 J	0.20 U	1.0 U

Client ID	MW-20		
Lab ID	200-15545-3	200-18709-4	
Date	3/15/2013	9/27/2013	
TCE	19	13	
PCE	1.0 U	1.0 U	
cis-1,2-DCE	1.0	0.71 J	

Client ID	URS-12		
Lab ID	R1104471-013	R1106001-027	200-15588-2
Date	8/11/2011	10/26/2011	3/18/2013
TCE	18	16	9.8
PCE	0.20 U	0.75 J	1.0 U
cis-1,2-DCE	0.21 J	0.38 J	1.0 U

Client ID	LAOW11-3		
Lab ID	R1104471-001	R1106001-017	200-15545-5
Date	8/9/2011	10/25/2011	3/15/2013
TCE	7.9	6	5.1
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-19		
Lab ID	200-15545-2	200-19527-6	
Date	3/15/2013	11/14/2013	
TCE	8.9	8.9	
PCE	1.0 U	1.0 U	
cis-1,2-DCE	1.0 U	1.0 U	

Client ID	MW-12		
Lab ID	200-15545-1	200-18709-5	
Date	3/15/2013	9/27/2013	
TCE	23	25	
PCE	1.0 U	1.0 U	
cis-1,2-DCE	1.1	1.8	

Client ID	LAOW11-6		
Lab ID	R1104471-009	R1106001-018	200-15632-2
Date	8/11/2011	10/25/2011	3/20/2013
TCE	9.6	8.2	5
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-18		
Lab ID	200-15605-3	200-19527-8	
Date	3/19/2013	11/14/2013	
TCE	92	160	
PCE	1.0 U	1.0 U	
cis-1,2-DCE	14	21	

Client ID	LAOW11-9		
Lab ID	R1104471-010	R1106001-019	200-15632-3
Date	8/11/2011	10/26/2011	3/20/2013
TCE	12	11	3.7
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-14		
Lab ID	200-15545-4	200-19527-2	
Date	3/15/2013	11/14/2013	
TCE	7.9	8.9	
PCE	1.00 U	1.00 U	
cis-1,2-DCE	0.54 J	0.37 J	

Client ID	LAOW11-4		
Lab ID	R1104584-007	R1106001-032	200-15632-6
Date	8/17/2011	10/26/2011	3/20/2013
TCE	49	49	29
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	2.2 J	2.2 J	1.4

Client ID	MW-13	
Lab ID	200-15526-2	200-19527-7
Date	3/14/2013	11/14/2013
TCE	1.0 U	1.0 U
PCE	1.0 U	1.0 U
cis-1,2-DCE	1.0 U	1.0 U

Client ID	MW-10R		
Lab ID	200-15632-4	200-18709-1	
Date	3/20/2013	9/27/2013	
Chloroethenes			
Trichloroethene	1.0 U	0.91 J	
Tetrachloroethene	1.0 U	1.0 U	
cis-1,2-Dichloroethene	1.0 U	1.0 U	
trans-1,2-Dichloroethene	1.0 U	1.0 U	
1,1-Dichloroethene	1.0 U	1.0 U	
Vinyl chloride	1.0 U	1.0 U	
Chloroethanes			
1,1,1-Trichloroethane	1.0 U	1.0 U	
1,1-Dichloroethane	1.0 U	1.0 U	
Aromatic Hydrocarbons			
Toluene	1.0 U	0.24 J	

Client ID	LAOW11-5		
Lab ID	R1104471-012	R1106001-002	200-15486-1
Date	8/11/2011	10/24/2011	3/12/2013
TCE	0.23 U	0.23 U	1.0 U
PCE	0.20 U	0.20 U	1.0 U
cis-1,2-DCE	0.20 U	0.20 U	1.0 U

Client ID	MW-15		
Lab ID	200-15526-1	200-19527-4	
Date	3/14/2013	11/14/2013	
TCE	1.0 U	1.0 U	
PCE	1.0 U	1.0 U	
cis-1,2-DCE	1.0 U	1.0 U	

Client ID	MW-16		
Lab ID	200-15526-10	200-19527-3	
Date	3/14/2013	11/13/2013	
TCE	0.58 J	1.0 U	
PCE	1.0 U	1.0 U	
cis-1,2-DCE	1.0 U	1.0 U	

Client ID	LARW11-2		
Lab ID	R1104584-019	R1106001-010	200-15632-5
Date	8/18/2011	10/26/2011	3/20/2013
Chloroethenes			
Trichloroethene	220 D	520 D	820
Tetrachloroethene	210 D	270 D	21
cis-1,2-Dichloroethene	310 D	960 D	1,000
trans-1,2-Dichloroethene	2.80 J	39	67
1,1-Dichloroethene	1.20 J	4.70 J	6.0 J
Vinyl chloride	5.7	15	17
Chloroethanes			
1,1,1-Trichloroethane	0.23 U	0.23 U	17.0 U
1,1-Dichloroethane	2.0 J	14.0	16.0 J
Aromatic Hydrocarbons			
Toluene	0.23 J	0.20 U	17.0 U

Client ID	LARW11-3		
Lab ID	R1104584-018	R1106001-001	200-15499-9
Date	8/17/2011	10/24/2011	3/13/2013
Chloroethenes			
Trichloroethene	0.69 J	1.30 J	2.90
Tetrachloroethene	0.20 U	0.20 U	1.0 U
cis-1,2-Dichloroethene	0.53 J	0.44 J	0.70 J
trans-1,2-Dichloroethene	0.20 U	0.20 U	1.0 U
1,1-Dichloroethene	0.29 U	0.29 U	0.40 J
Vinyl chloride	0.24 J	0.23 U	0.34 J
Chloroethanes			
1,1,1-Trichloroethane	0.62 J	0.37 J	1.10
1,1-Dichloroethane	2.20 J	2.00 J	4.60
Aromatic Hydrocarbons			
Toluene	0.20 U	0.20 U	1.0 U

Client ID	MW-17	
Lab ID	200-15526-1	200-19527-5
Date	3/14/2013	11/13/2013
TCE	1.0 U	1.0 U
PCE	0.52 J	0.21 J
cis-1,2-DCE	1.0 U	1.0 U

NYSDEC Class GA Groundwater	
Chloroethenes	
Trichloroethene	5
Tetrachloroethene	5
cis-1,2-Dichloroethene	5
trans-1,2-Dichloroethene	5
1,1-Dichloroethene	5
Vinyl chloride	2
Chloroethanes	
1,1,1-Trichloroethane	5
1,1-Dichloroethane	5
Aromatic Hydrocarbons	
Toluene	5

Notes:
All results reported in micrograms per liter

J = Concentration is an estimated value above the reported method detection limit, but below the laboratory reporting limit.

U = Constituent was not detected above the reported laboratory reporting limit.

TCE = Trichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
PCE = Tetrachloroethene
NS = Not Sampled
NL = Not Located in the Field

EHS Support *consider it done*

360 180 0 360
Scale In Feet

LEE AVENUE RAILROAD AREA
NORWICH, NEW YORK
NYS #709014

Drawn By: MDO	Plot: 11/2013
Review By: MSS	Plot: 11/2013
Scale: 1" = 360'	Plot: 11/2013

FIGURE 2
REMEDIAL INVESTIGATION MONITORING WELL LOCATIONS AND ANALYTICAL EXCEEDENCE MAP

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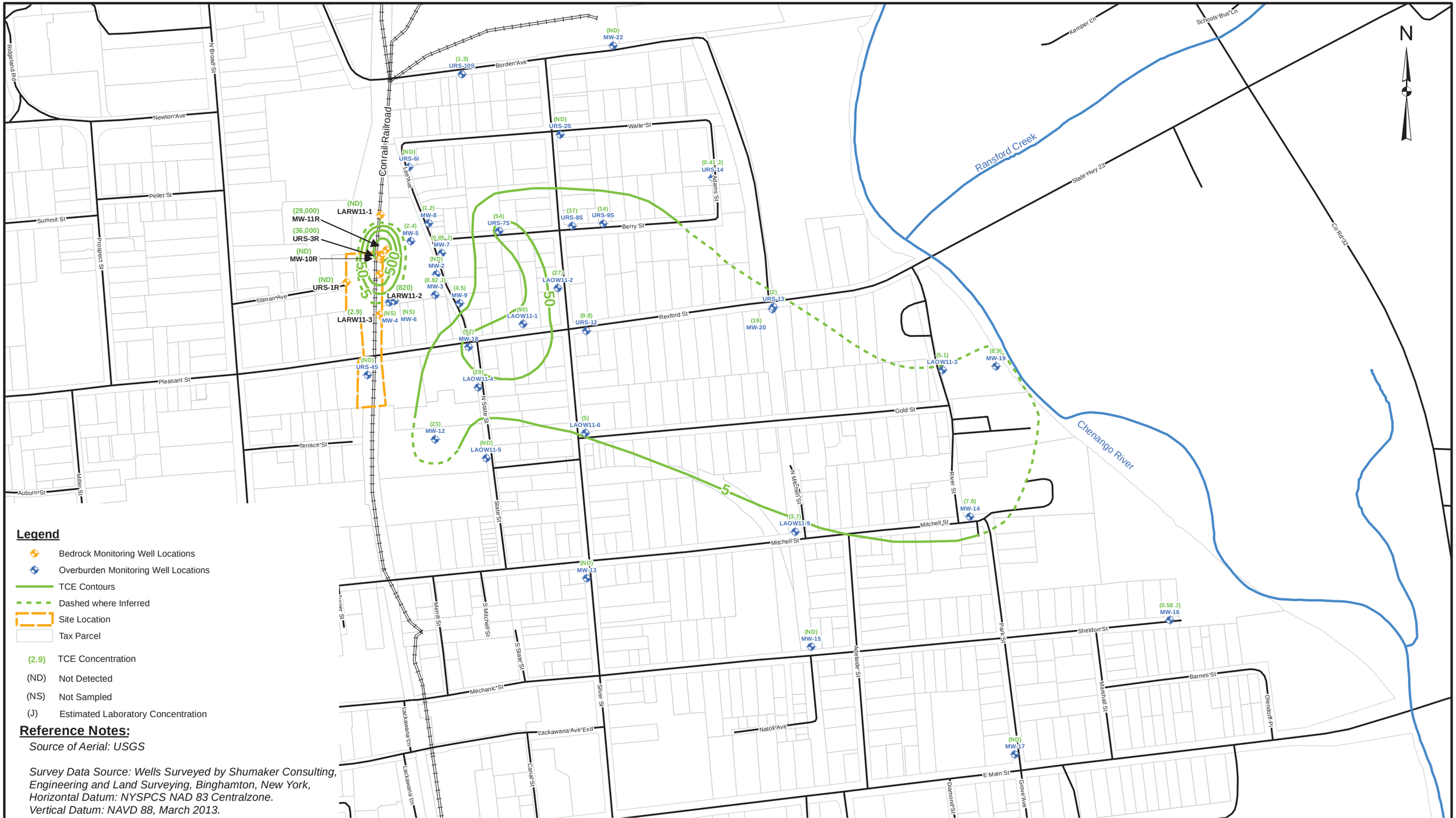

Legend

- Bedrock Monitoring Well Locations
- Overburden Monitoring Well Locations
- TCE Contours
- Dashed where Inferred
- Site Location
- Tax Parcel

(2.9) TCE Concentration
(ND) Not Detected
(NS) Not Sampled
(J) Estimated Laboratory Concentration

Reference Notes:

Source of Aerial: USGS

Survey Data Source: Wells Surveyed by Shumaker Consulting, Engineering and Land Surveying, Binghamton, New York, Horizontal Datum: NYSPCS NAD 83 Centralzone. Vertical Datum: NAVD 88, March 2013.

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360 180 0 360
Scale In Feet

Lee Avenue Railroad Area
Norwich, New York
NYS #709014

FIGURE 3
TRICHLOROETHENE ISOCONCENTRATION MAP
MARCH 2013

Drawn By: MDO	Date: 09/2013
Review By: MSS	Date: 09/2013
Scale: 1" = 360'	Plot: 09/2013

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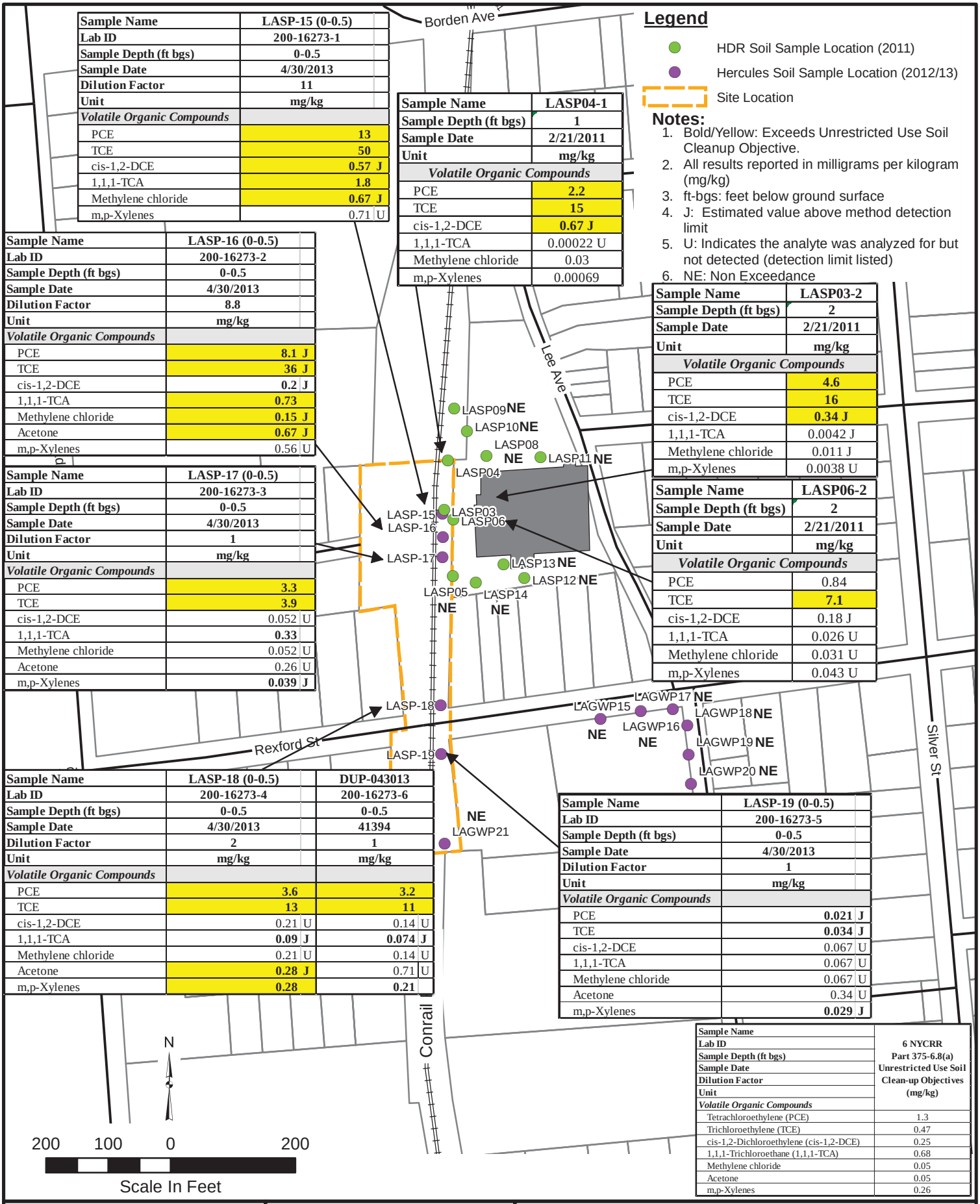

Legend

- HDR Soil Sample Location (2011)
- Hercules Soil Sample Location (2012/13)
- Site Location

Notes:

1. Bold/Yellow: Exceeds Unrestricted Use Soil Cleanup Objective.
2. All results reported in milligrams per kilogram (mg/kg)
3. ft-bgs: feet below ground surface
4. J: Estimated value above method detection limit
5. U: Indicates the analyte was analyzed for but not detected (detection limit listed)
6. NE: Non Exceedance

Sample Name	LASP-15 (0-0.5)
Lab ID	200-16273-1
Sample Depth (ft bgs)	0-0.5
Sample Date	4/30/2013
Dilution Factor	11
Unit	mg/kg
Volatile Organic Compounds	
PCE	**13**
TCE	**50**
cis-1,2-DCE	**0.57 J**
1,1,1-TCA	**1.8**
Methylene chloride	**0.67 J**
m,p-Xylenes	0.71 U

Sample Name	LASP04-1
Sample Depth (ft bgs)	1
Sample Date	2/21/2011
Unit	mg/kg
Volatile Organic Compounds	
PCE	**2.2**
TCE	**15**
cis-1,2-DCE	**0.67 J**
1,1,1-TCA	0.00022 U
Methylene chloride	0.03
m,p-Xylenes	0.00069

Sample Name	LASP-16 (0-0.5)
Lab ID	200-16273-2
Sample Depth (ft bgs)	0-0.5
Sample Date	4/30/2013
Dilution Factor	8.8
Unit	mg/kg
Volatile Organic Compounds	
PCE	**8.1 J**
TCE	**36 J**
cis-1,2-DCE	**0.2 J**
1,1,1-TCA	**0.73**
Methylene chloride	**0.15 J**
Acetone	**0.67 J**
m,p-Xylenes	0.56 U

Sample Name	LASP03-2
Sample Depth (ft bgs)	2
Sample Date	2/21/2011
Unit	mg/kg
Volatile Organic Compounds	
PCE	**4.6**
TCE	**16**
cis-1,2-DCE	**0.34 J**
1,1,1-TCA	0.0042 J
Methylene chloride	0.011 J
m,p-Xylenes	0.0038 U

Sample Name	LASP-17 (0-0.5)
Lab ID	200-16273-3
Sample Depth (ft bgs)	0-0.5
Sample Date	4/30/2013
Dilution Factor	1
Unit	mg/kg
Volatile Organic Compounds	
PCE	**3.3**
TCE	**3.9**
cis-1,2-DCE	0.052 U
1,1,1-TCA	**0.33**
Methylene chloride	0.052 U
Acetone	0.26 U
m,p-Xylenes	**0.039 J**

Sample Name	LASP06-2
Sample Depth (ft bgs)	2
Sample Date	2/21/2011
Unit	mg/kg
Volatile Organic Compounds	
PCE	0.84
TCE	**7.1**
cis-1,2-DCE	0.18 J
1,1,1-TCA	0.026 U
Methylene chloride	0.031 U
m,p-Xylenes	0.043 U

Sample Name	LASP-18 (0-0.5)	DUP-043013
Lab ID	200-16273-4	200-16273-6
Sample Depth (ft bgs)	0-0.5	0-0.5
Sample Date	4/30/2013	41394
Dilution Factor	2	1
Unit	mg/kg	mg/kg
Volatile Organic Compounds		
PCE	**3.6**	**3.2**
TCE	**13**	**11**
cis-1,2-DCE	0.21 U	0.14 U
1,1,1-TCA	**0.09 J**	**0.074 J**
Methylene chloride	0.21 U	0.14 U
Acetone	**0.28 J**	0.71 U
m,p-Xylenes	**0.28**	**0.21**

Sample Name	LASP-19 (0-0.5)
Lab ID	200-16273-5
Sample Depth (ft bgs)	0-0.5
Sample Date	4/30/2013
Dilution Factor	1
Unit	mg/kg
Volatile Organic Compounds	
PCE	**0.021 J**
TCE	**0.034 J**
cis-1,2-DCE	0.067 U
1,1,1-TCA	0.067 U
Methylene chloride	0.067 U
Acetone	0.34 U
m,p-Xylenes	**0.029 J**

Sample Name	6 NYCRR Part 375-6.8(a) Unrestricted Use Soil Clean-up Objectives (mg/kg)
Lab ID	
Sample Depth (ft bgs)	
Sample Date	
Dilution Factor	
Unit	
Volatile Organic Compounds	
Tetrachloroethylene (PCE)	1.3
Trichloroethylene (TCE)	0.47
cis-1,2-Dichloroethylene (cis-1,2-DCE)	0.25
1,1,1-Trichloroethane (1,1,1-TCA)	0.68
Methylene chloride	0.05
Acetone	0.05
m,p-Xylenes	0.26

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Dec. 2014

Lee Avenue Railroad Area
Norwich, New York
NYS #709014

Figure 4
Unrestricted Use Soil Exceedance Map
Volatile Organic Compounds

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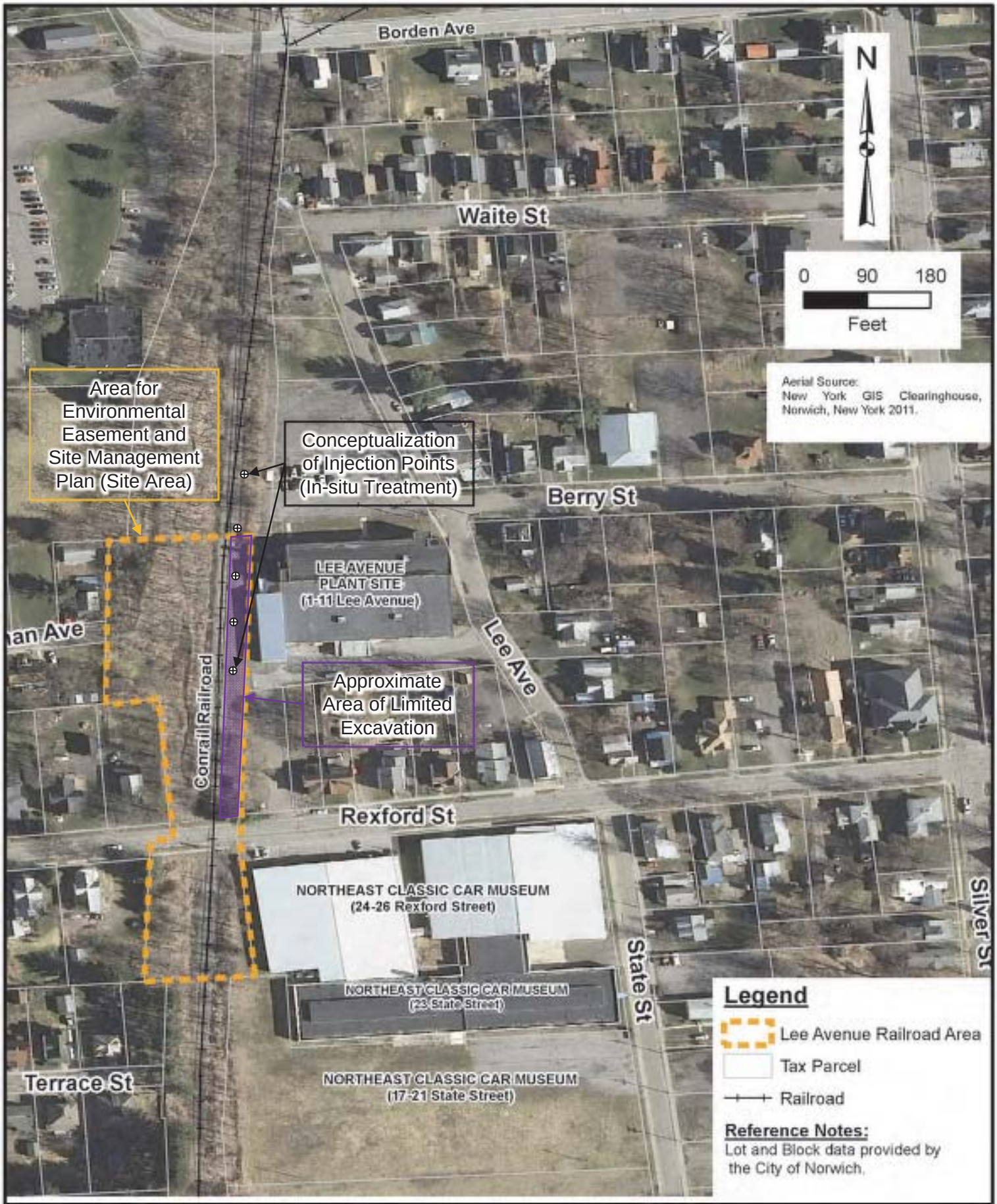

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Dec. 2014

FIGURE 5
PROPOSED REMEDY
LEE AVENUE RAILROAD AREA
NYS #709014
NORWICH, NEW YORK

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APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Lee Ave Railroad Area
State Superfund Project
Norwich, Chenango County, New York
Site No. 709014

The Proposed Remedial Action Plan (PRAP) for the Lee Ave Railroad Area site was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on February 24, 2017. The PRAP outlined the remedial measure proposed for the contaminated groundwater, soil, and soil vapor at the Lee Ave Railroad Area site.

The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on March 21, 2017, which included a presentation of the remedial investigation feasibility study (RI/FS) for the Lee Ave Railroad Area site as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the PRAP ended on March 26, 2017.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

COMMENT 1: How frequently are the monitoring wells sampled?

RESPONSE 1: The entire monitoring well network used for the remedial investigation was sampled twice; however, some of the wells within the network were sampled three times. Additional groundwater sampling is also included as part of the selected remedy and referenced in Section 7 of the Record of Decision (ROD). Monitoring frequency will be sufficient to evaluate the effectiveness of the remedy and will occur at a minimum frequency of one sampling event per year for at least five years.

COMMENT 2: Shouldn't all foundation cracks or gaps around any utility penetrations through foundation walls be sealed for proper soil vapor mitigation at a home?

RESPONSE 2: All sub-slab depressurization systems (SSDSs) installed by Hercules Incorporated to mitigate the migration of vapors from groundwater have been constructed according to the New York State Department of Health, "Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York", dated October 2006. Based on indoor air samples collected after mitigation system installations, all systems have been shown to be effectively addressing the potential for soil vapor intrusion for each mitigated home, which is the remedial goal for these

systems. If a mitigation system is shown to be successfully mitigating the air contamination, no further construction steps are required.

COMMENT 3: Why aren't indoor air samples collected on the first floor of homes? Some homes that were sampled in the off-site area from 2005 to 2007 included first floor air samples and the first floor air samples showed higher contaminant concentrations than the basement air samples.

RESPONSE 3: The sampling protocol to evaluate the potential for soil vapor intrusion has changed over time based on sampling results collected from soil vapor intrusion evaluations conducted statewide. Results from those evaluations showed that basement air samples typically represent the worst case scenario (highest levels) for exposure to contaminants associated with soil vapor intrusion. For example, sampling for this site from 2005 to 2007 shows that approximately 82 percent of basement air samples had greater concentration of trichloroethene (TCE) than first floor air samples. At homes where the concentration of TCE in the first floor air sample was greater than the basement air sample, the typical value or geometric mean for the differences in concentration was only 0.74 micrograms per cubic meter ($\mu g/m^3$).

For evaluation of the potential for soil vapor intrusion at a home, the typical sample set includes a sub-slab vapor sample, a basement air sample, and a representative outdoor air sample. Following installation of a SSDS, the basement air is resampled to provide data to show the reduction in contaminant concentration in the indoor air which verify that the SSDS is effective. Resampling basement air allows a comparison to the sampling that was conducted for evaluation of the home.

Operation of a SSDS results in lower sub-slab air pressure relative to indoor air pressure, which prevents the infiltration of sub-slab vapors into the building. Measured reductions of contaminant concentrations in basement air that show effective mitigation of soil vapor intrusion can be used as an analog for changes in air quality for overlying living spaces.

The recommended actions for all homes are protective of public health. Based on sampling results at this site, the recommended actions for homes where first floor air samples were collected would be unchanged even if first floor air sampling results were discounted at those locations.

COMMENT 4: Why aren't first floor air samples collected instead of basement air samples when evaluating effectiveness of SSDSs?

RESPONSE 4: See RESPONSE 3.

COMMENT 5: Why isn't access to the site restricted? There are people walking along the railroad tracks at the site.

RESPONSE 5: Soil at the site that exhibits detections of contamination are located underneath weathered pavement material or the crushed stone used as railroad ballast and are not directly exposed at the ground surface. People will not come into contact with site-related soil contamination unless they dig below the surface.

Contaminated soil will be removed as part of the remedial action and is described in Section 7 of the ROD.

COMMENT 6: Is the outdoor air quality at the site good?

RESPONSE 6: Outdoor air quality has been sampled at multiple locations within the neighborhood during each soil vapor intrusion evaluation sampling event and consistently shows concentrations of TCE to be below background concentrations. Background outdoor air concentrations of TCE are the concentrations measured in the absence of a known local point-source of TCE. Background concentrations are almost always 1 $\mu g/m^3$ or less. Greater than 80 percent of the nearly 70 outdoor air samples collected since 2005 have shown no detection of TCE.

COMMENT 7: Is it safe to consume produce from a garden that is irrigated from a private well? [Commenter noted that there are private wells in the neighborhood used for these purposes.]

RESPONSE 7: The use of private well water for irrigation purposes within the areas of off-site groundwater contamination has been unknown to the Department and NYSDOH. The NYSDOH recommends utilizing public water that is available for all uses at your home. To completely answer this question, we would have to understand the concentrations of site-related contaminants that exist, if any, in the water used for irrigation purposes. The primary site-related contaminant in off-site groundwater is TCE. TCE is highly volatile which means it moves from water to air easily. When you water the garden, especially through spray irrigation, the amount of TCE in the water will be significantly lowered as it moves into the air. Therefore, very little TCE is expected to be available to the garden plants. Any TCE that is remaining in the water can be taken up by plants; however, the plants will move the TCE through their leaves into the air.

Measures can be taken to reduce the potential for exposure, if any, while growing vegetables at a property within an urban environment. Some of these measures include growing vegetables in a raised bed, washing produce thoroughly before consuming, and washing your hands after gardening. Additional information about healthy gardening may be found at: http://www.health.ny.gov/publications/1301/.

COMMENT 8: Is it safe to consume produce from gardens that are grown in an area that may contain TCE within the soil vapor?

RESPONSE 8: See RESPONSE 7; very little TCE is expected to be available to the garden plants through soil vapor. Any TCE that is in soil vapor may be taken up by plants; however, the plants will move the TCE through their leaves into the air.

COMMENT 9: Does the NYSDOH consider a home that has been mitigated to be a safe living environment?

RESPONSE 9: In all homes where soil vapor intrusion sampling has occurred, the recommended actions by the Department and the NYSDOH, in the form of mitigation systems, are protective of public health. Also, please see RESPONSE 2.

COMMENT 10: What is the frequency of inspection for a mitigation system and if there is a noticeable problem with the system, who should be contacted?

RESPONSE 10: Inspection and maintenance details for mitigation systems will be included within the Site Management Plan (SMP) that is summarized in Section 7 of the ROD. Prior to finalization of the SMP, the systems are managed by Hercules Incorporated through an interim inspection and maintenance work plan titled, "Inspection and Maintenance Work Plan for Sub-Slab and Sub-Membrane Ventilation Systems", dated February 2013. In general, the mitigation systems are inspected approximately 18 months after the installation date and then rely on system operational checks by the home owner or residents. Instructions for the operational checks are provided in SSDS operational fact sheet that has been provided to homeowners. When finalized, the SMP will include requirements for annual mailing of the operational fact sheet to each home with a SSDS.

The contact number for reporting suspected problems with a SSDS is 1-866-323-3921. This is a toll free telephone number for Hercules Incorporated. This number has been provided to all homeowners with a SSDS.

COMMENT 11: If I contemplate selling my home, and my home has a SSDS, what do I need to disclose to a potential buyer?

RESPONSE 11: Many sellers of residential real property are required by Section 462 of New York's Real Property Law to complete a "property condition disclosure statement" to be provided to a purchaser prior to entering into a real estate contract. The statement requires information regarding environmental concerns and the testing of the property for contamination.

COMMENT 12: Do you know how deep the excavation will be on-site?

RESPONSE 12: Final excavation depth will be determined through remedial design activities (e.g., additional soil sampling) and will likely be variable in depth within the excavation area. Excavation depth will also be limited by the depth to bedrock, thus, the maximum depth of excavation within the excavation area is anticipated to be less than five feet.

COMMENT 13: Who will be providing oversight of the remedial activities?

RESPONSE 13: Remedial activities will be overseen by the Department in consultation with the NYSDOH.

COMMENT 14: What is the timeline for implementation of the cleanup plan?

RESPONSE 14: Feedback provided by Hercules Incorporated, indicates that elements of the remedial action (i.e., excavation) could occur by late summer 2017. Activities prior to implementation will include steps such as remedial design, review and approval of design, remedial contractor selection, contractor mobilization, and site preparation.

COMMENT 15: What was the public outreach for notification of the public comment period and the public meeting?

RESPONSE 15: Public outreach was conducted pursuant to the Citizen Participation Plan (CPP) for this site, dated November 2013. Although not specifically or individually listed within the CPP, Hercules Incorporated sent a hard copy of the fact sheet to all property owners or residents that have been included in the off-site soil vapor intrusion evaluation.

In addition to the contacts listed in the CPP, the Department provided the fact sheet information through our county based email listserv. Notification and encouragement to sign up for the listserv was sent in 2009 for this site and for other sites in Chenango County. The listserv notification included project specific contacts (e.g., adjacent property owners), government entities, elected officials, and media outlets.

APPENDIX B

Administrative Record

Administrative Record

Lee Ave Railroad Area
State Superfund Project
Norwich, Chenango County, New York
Site No. 709014

1. Proposed Remedial Action Plan for the Lee Ave Railroad Area site, dated February 2017, prepared by the Department.

2. Order on Consent and Administrative Settlement, Index No. R7-0787-12-06, between the Department and Hercules incorporated, executed on July 10, 2012.

3. "Records Search Report, Lee Avenue Railroad Area, Norwich, New York. NYSDEC #709014", August 2012, prepared by EHS Support LLC.

4. "Remedial Investigation/Feasibility Study Work Plan, Lee Avenue Railroad Area, Norwich, New York. NYSDEC #709014", September 2012, prepared by EHS Support LLC.

5. "Remedial Investigation Report, Lee Avenue Railroad Area, Norwich, New York. NYSDEC #709014", May 2014, prepared by EHS Support LLC.

6. "Feasibility Study Report, Lee Avenue Railroad Area, Norwich, New York. NYSDEC #709014", February 2016, prepared by EHS Support LLC.

APPENDIX B

Right of Entry Permit

The New York, Susquehanna and Western Railway Corporation
1 Railroad Avenue
Cooperstown, NY 13326
607-547-2555
Fax: 607-547-9834
www.nysw.com

June 27, 2017

Ms. Mary Donahue
Senior Paralegal
Ashland LLC
Environmental, Product Regulatory & Legal Trade Group
5200 Blazer Parkway
Dublin, OH 43017

Sent via email to madonahue@ashland.com

Dear Ms. Donahue,

This letter is to acknowledge that the Right of Entry Permit #P570 has been renewed for a two-year period, starting June 30, 2017. Under the terms of the permit each additional renewal requires a renewal fee of $1,975.00. Please submit this amount to the address above to the attention of Nadine Steckler.

Your right of entry permit covers the following scope of work in Norwich, NY for 2017:

- Site Survey – verify soil excavation area and required set-backs from centerline and Rexford Street (1-day)
- Well Sampling – groundwater sample existing monitoring wells. (2-days)
- Verify depth to shallow bedrock within proposed soil excavation area using direct push (anticipated to be no greater than 5 feet) (1-day)

You will need to notify Rick Howard at 607-547-2555, ext. 222 at least five (5) days in advance of your entering the property.

Attached to this email you will find a document with safety requirements including insurance. Please review this document, sign and return to me by email.

If you have any questions, please let me know.

Regards,

Melanie Boyer
Manager, Government and Public Relations

PERMIT TO ENTER UPON PROPERTY OF
THE NEW YORK SUSQUEHHANA AND WESTERN RAILWAY CORPORATION

PERMISSION is hereby granted on this___ day of December, 2012, to Hercules Incorporated, a wholly-owned subsidiary of Ashland Inc. ("Hercules"), whose mailing address is 5200 Blazer Parkway, Dublin, Ohio 43017, c/o James E. Vondracek, P.E., Principal Engineer, including its contractors, agents, employees and consultants, to enter property of The New York, Susquehanna and Western Railway Corporation, ("Railway"), located at RR ROW at RR MP 233.23 in Norwich, New York ("Property"), for the purpose of performing certain work described in the Statement of Work attached at Exhibit A ("Work"), pursuant to the New York Department of Environmental Conversation's ("NYSDEC") investigation of the Lee Avenue Railroad (NYS Project No. 709014), under the following terms and conditions:

1. LOCATION AND ACCESS: The Property described above, as further described in the attached Exhibits A and A-1, which are incorporated herein by reference. Hercules acknowledges that the Railway does not make any representations regarding the condition of the Property, and has no obligation to supervise or manage the Work.

2. LIABILITY: Hercules shall release, indemnify, defend, and save harmless the Railway from and against all damages, losses, claims, demands, suits, costs or expenses, including counsel fees, which the Railway may suffer or sustain, or be subject to, directly or indirectly, for personal injury, death or property damage caused by Permittee's performance of the Work on the Property, except to the extent that a factfinder concludes that such damages, losses, claims, demands, suits, costs or expenses were caused by the negligence or willful misconduct of the Railway or the Railway's officers, agents, employees, contractors or licensees. Railway must promptly notify Hercules of any such claim and provide Hercules the opportunity to defend same. Where Hercules accepts the defense of a tendered claim, Hercules may defend, settle, compromise or discharge such claims in its sole discretion. Notwithstanding the foregoing, nothing in this Permit shall affect the parties' respective rights and obligations with respect to the investigation and/or remediation of any pre-existing contamination at or emanating from the Property, and the parties expressly reserve all rights, claims and defenses with regard thereto.

3. CONSIDERATION: Hercules will pay to the Railway the sum of NINETEEN HUNDRED SEVENTY FIVE DOLLARS ($1,975.00), as a compensation for the preparation of this permit.

4. NOTIFICATION OF USE OF PROPERTY: Hercules shall notify the Vice President of Engineering of the Railway, or his designee, at least FIVE (5) days in advance before entering upon or starting any work upon Railway property. No entry or use of Railway property will be permitted until this permit is signed and charges thereunder paid.

5. RAILWAY OPERATIONS:

a. All Work shall be carried on in such a manner as not to unreasonably interfere with the operations or the use of any Railway facilities. Equipment or material shall not be transported across a track or tracks without special permission from the Vice President of Engineering of the Railway or his designee.

b. As of the date of this Permit, there are no operating lines on the Property. In the event that track operations are to resume during the term of this Permit, the Railway shall notify Hercules at least 30 days prior thereto, and the following additional requirements shall apply:

i. FLAG PROTECTION: Hercules agrees to pay to the Railway the full cost and expense for any flag protection that may be needed for track crossings.

ii. CLEARANCES: All equipment working on or material in use upon the property of the Railway shall be kept not less than fifteen feet (15') from the centerline of the nearest railroad track, or as subsequently modified in writing by the said Vice President of Engineering or his designee. Hercules shall conduct its operations so that no part of its equipment shall foul an operated track, transmission, signal or communication lines, or any other structure of the Railway.

iii. WORK ON RAILWAY RIGHT-OF-WAY: Hercules shall comply with the requirements for work on the Railway's right-of-way as set forth in Exhibit B attached hereto.

6. RESTORATION OF PREMISES: Upon completion of the Work, the Property shall be left in as close to its preexisting condition as is reasonably possible. This includes, without limitation, the restoration immediately of any fences removed. In the event that there is any disturbance to the tracks and/or track bed, Hercules agrees to restore them to their functionally equivalent condition.

7. DATA AND REPORTS: Hercules agrees to provide the Railway with copies of all sampling results and final reports that Hercules generates in connection with the Work.

8. TERM OF PERMIT: This permit shall be effective as of the date set forth above and shall continue for a period of two years. Thereafter, this permit shall automatically renew for two consecutive two-year periods, unless the Railway provides written notice of cancellation to Hercules at least sixty (60) days prior to the expiration of the initial two-year term or subsequent renewal term; provided, however, that the Railway acknowledges that Hercules may require continued access to the

Property to conduct the Work, and the Parties intend that such access shall be preserved until such time as Hercules has completed the Work. Consistent with the foregoing, this Agreement shall terminate upon Hercules' completion of the Work. Hercules agrees to notify the Railway when use of the Property and Work is completed. If one or both of the two-year renewal terms are required, Hercules agrees to pay the Railway a renewal fee of $1,975.00 per renewal. Under no circumstance shall this temporary permit be construed as granting Hercules any right, title or intent of any kind or character in, or about the land or premises of the Railway.

9. NOTICE: Any Notice provided for in this permit shall be directed to the following individuals:

For Hercules:
Richmond L. Williams
Chief Counsel, Environment Litigation
Ashland Inc.
500 Hercules Road
Wilmington, DE 19808
Telephone No.: 302-594-7020

For Railway:
Richard Hensel
Vice President of Engineering
The New York Susquehanna and
Western Railway Corporation
1 Railroad Avenue
Cooperstown, New York 13326
Telephone No.: 607-547-2555, ext. 261 or 264

10. SUCCESSORS: This permit shall be binding on the successors and assigns of the Railway and Hercules. This Agreement may not be assigned in whole or in part without written consent of the Railway and Hercules.

11. ENTIRE AGREEMENT: This Agreement constitutes the entire agreement between the Railway and Hercules concerning access to the Property and may not be modified or amended except in writing signed by all the parties.

12. COUNTERPARTS: This Agreement may be executed in counterparts.

PERMIT TO ENTER UPON PROPERTY OF
THE NEW YORK SUSQUEHHANA AND WESTERN RAILWAY CORPORATION

AGREED AND ACCEPTED

HERCULES INCORPORATED

By: _____
Name: MAZIE H. HERCHERT
Title: Manager - Remediation
Date: 12/14/2012

THE NEW YORK SUSQUENNA WESTERN RAILWAY CORPORATION

By: _____
Name: NATHAN R. FEMO
Title: PRESIDENT
Date: 1-2-2013

EXHIBIT A
STATEMENT OF WORK

Hercules will be accessing the Property to perform the work necessary to complete site investigation activities required by NYSDEC, including evaluating the nature and extent of potential trichloroethene impacts associated with NYS Spill # 709014. Provided below is the current scope of work approved by the NYSDEC. (See attached Exhibit A-1). Additional work may be necessary and will be completed under the terms and conditions of the access permit between the parties.

- **Soil Sampling**
  Collection of five (5) surface soil samples within the Property boundary. Collection of one soil sample and one groundwater sample from a single temporary well point in the south end of the Property.

- **Well Installation**
  Installation of two new monitoring wells in the bedrock aquifer north of Rexford Street.

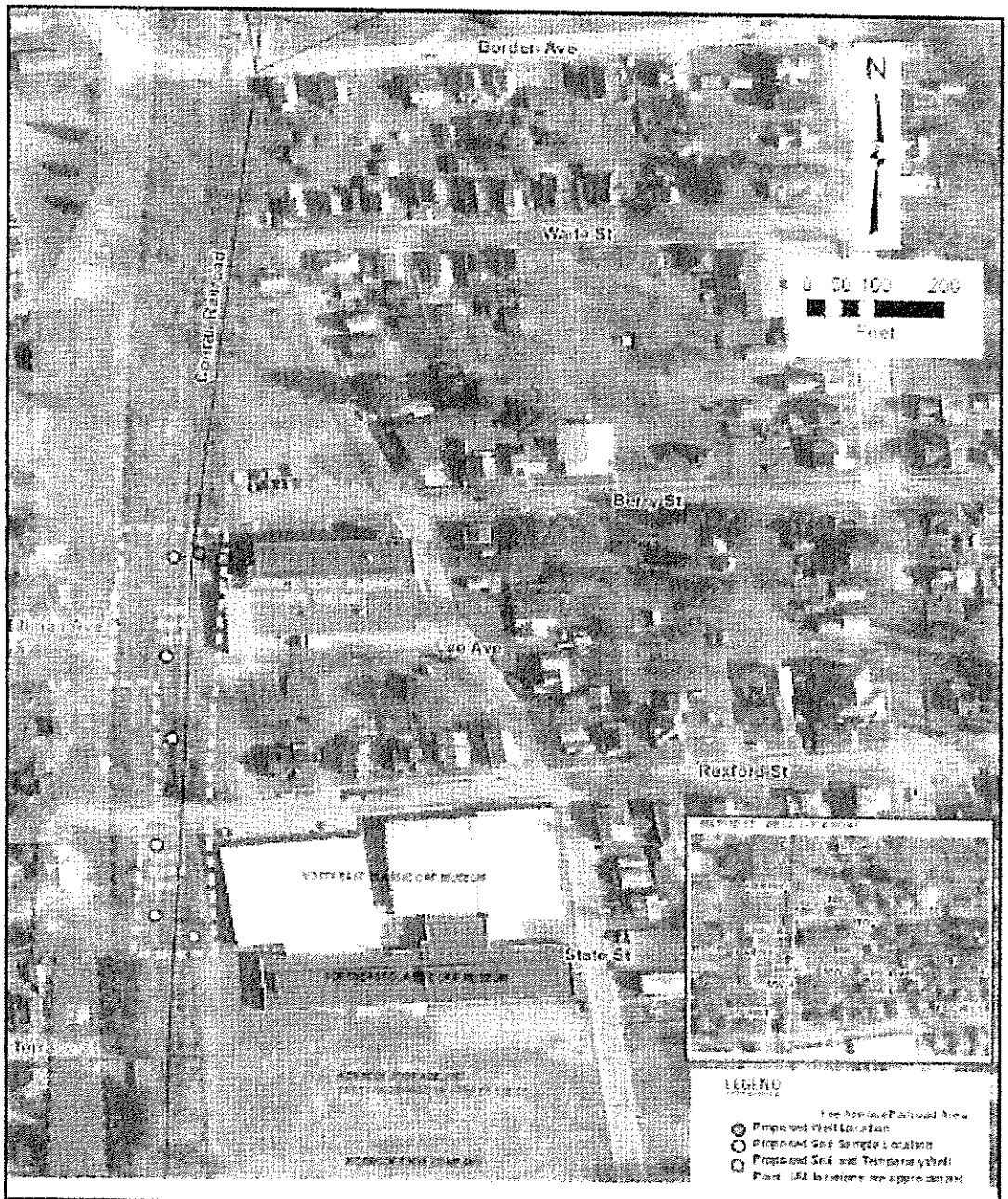
- **Groundwater Sampling**
  Complete groundwater gauging and sampling from all existing monitoring wells, including wells previously installed by others (URS-1R, URS-3R, LARW11-1, LARW11-2, and LARW11-3). (Refer to Exhibit A-1, map inset).

  Activities also include routine inspection and maintenance of monitoring wells to evaluate well integrity. New and existing wells will be surveyed by a licensed contractor to identify ground surface and groundwater elevations.

- **Material Staging**
  Investigational derived waste, such as soil cuttings and purge water will be containerized and stored on-site in 55-gallon steel drums for subsequent waste characterization, transport and disposal by Hercules and its contractors.

- **Utility Clearance**
  The NYS Dig Safety New York Utility Protection Center (811) will be contacted in advance of initiating intrusive activities so that subsurface utilities are identified. Although no intrusive activities are proposed on the Property during the initial phase of work, utility contractors may be observed clearing utilities in areas along the railroad right-of-way, Lee Avenue, and/or Rexford Street.

EXHIBIT A-1
SITE PLAN



EHS Support	AERIAL SITE PLAN Lee Avenue Railroad Area, Norwich, New York NYS #709014	Exhibit A-1

APPENDIX C

C-1 Community Air Monitoring Plan

C-2 Fugitive Dust Monitoring Plan

APPENDIX C-1

Community Air Monitoring Plan

Lee Avenue Railroad Area NYS #709014

This Community Air Monitoring Plan (CAMP) has been prepared for the Lee Avenue Railroad Area project located in the City of Norwich, Chenango County, New York (NYS #709014) and has been prepared to meet the requirements set forth in the DER-10 Guidance Appendix 1A.

The purpose of the CAMP is to provide a measure of protection for the downwind community from potential airborne contaminant releases as a direct result of remedial work activities. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Activities completed under this scope of work include soil excavation and backfill, groundwater sampling, monitoring well installation, and investigation derived waste management (i.e., handling soil and groundwater in drums). The primary constituents of concern (COCs) are volatile organic compounds (VOCs) including trichloroethene (TCE) and its degradation products tetrachloroethene, cis-1,2-dichloroethene, trans-1-2-dichloroethene, 1,1-dichloroethane, 1,1-dichloroethene, and vinyl chloride. No radiological material is suspected to be present.

The CAMP requires real-time monitoring for VOCs and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. Continuous and periodic air monitoring for VOCs will be conducted throughout the remedial action, as appropriate and are described below.

Continuous monitoring will be required for all ground intrusive activities. Ground intrusive activities include, but are not limited to, soil excavation and handling, and the installation of soil borings or monitoring wells.

Continuous monitoring will be conducted with a flame ionization detector (FID) or photoionization detector (PID) within the work zone to monitor change in site conditions. Any sustained readings above background for greater than 15 minutes will require a stop work action. Continuous monitoring will include establishing background concentrations, screening workers breathing zone and monitoring downwind perimeter of the immediate work area.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

Periodic monitoring will be conducted with a FID or PID within the work zone during each sampling event to monitor changes in site conditions. Any sustained reading above background for great than 15 minutes will require a stop work action.

VOC Monitoring, Response Levels, and Actions

The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities do not spread contamination off-site through the air.

VOCs will be monitored with the work zone and at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present (i.e, FID or PID). The equipment will be calibrated at a minimum daily. **The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.**

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds **5 parts per million (ppm**) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in **excess of 5 ppm over background but less than 25 ppm, work activities must be halted**, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level **is above 25 ppm at the perimeter of the work area, activities must be shutdown.**
4. All 15-minute readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of

activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

APPENDIX C-2

Fugitive Dust and Particulate Monitoring Plan

Lee Avenue Railroad Area NYS #709014

This Fugitive Dust and Particulate Monitoring Plan has been prepared for the Lee Avenue Railroad Area project located in the City of Norwich, Chenango County, New York (NYS #709014) and has been prepared to meet the requirements set forth in the DER-10 Guidance Appendix 1B.

The purpose of the Fugitive Dust and Particulate Monitoring Plan is to supplement the CAMP and provide a measure of protection for the downwind community from potential airborne contaminant releases as a direct result of remedial work activities. The following fugitive dust suppression and particulate monitoring program will be employed during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:
    a. Objects to be measured: Dust, mists or aerosols;
    b. Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :µg/m3);
    c. Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
    d. Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
    e. Resolution: 0.1% of reading or 1g/m3, whichever is larger;
    f. Particle Size Range of Maximum Response: 0.1-10;
    g. Total Number of Data Points in Memory: 10,000;
    h. Logged Data: Each data point with average concentration, time/date and data point number
    i. Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
    j. Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
    k. Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
    l. Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
    m. Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 µg/m3 (15 minutes average). While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 µg/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 µg/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 µg/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.
6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential-- such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.
7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:
    a. Applying water on haul roads;
    b. Wetting equipment and excavation faces;
    c. Spraying water on buckets during excavation and dumping;
    d. Hauling materials in properly tarped or watertight containers;
    e. Restricting vehicle speeds to 10 mph;
    f. Covering excavated areas and material after excavation activity ceases; and
    g. Reducing the excavation size and/or number of excavations.

    Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.
8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX D

Investigative Derived Waste Management Plan

APPENDIX D

Investigation Derived Waste Management Plan

Lee Avenue Railroad Area NYS #709014

This Investigation Derived Waste (IDW) Management Plan has been prepared for the Lee Avenue Railroad Area project located in the City of Norwich, Chenango County, New York (NYS #709014). The purpose of the IDW management plan is to provide procedures for the handling of IDW generated during remedial action activities including soil excavation, well installation/development and monitoring well sampling. Types of waste media include soil, groundwater and personal protective equipment.

Pre-screening analysis has characterized soil and groundwater as non-hazardous. However, proper handling, temporary storage, transport and disposal is important to project success. Provided below are general waste management practices and site-specific waste management practices.

General Waste Management Practices

Below are some bullet points for properly managing waste materials:

1. Ensure all personnel handling IDW are properly trained on an annual basis including 40-hour OSHA Hazwoper Training, including but not limited to annual Hazwoper fresher and 8-Hr OHSA Supervisor training.
2. Keep potentially different types of waste materials segregated (e.g., fluids separate from solids, soil from general refuse)
3. Ensure adequate aisle space (approx. 2') between rows of containers, especially drums.
4. All labels should be facing outward to easily identify each container especially in the unlikely event of an emergency such as a fire or leaking containers
5. Ensure all containers are properly marked/labeled including any required DOT labels:
    a. Place a waste label (Hazardous, Non-Hazardous, Pending Analysis, etc.) on the upper one-third of the drum.
    b. If a DOT labeled is required, place adjacent to the waste label on the left side preferably.
    c. Write the date of generation on the label or drum (adjacent to label, preferably on right side) with indelible marker (on drum use paint pen, china marker etc.).
    d. Assign a waste container number to each container unless it already has a number on it such as with some roll offs and write on the container below the generation date.
    e. If available, write the Profile number either on the label or drum (anywhere in close association with the other marking/labeling above).
6. Ensure all waste containers are properly closed/sealed except when adding waste to prevent potential vapor/dust emissions and avoid getting rain water into the container.
7. At the end of each sampling activity before leaving the site, conduct an observation of all waste containers and document in field book.
8. Keep map updated with locations of waste collection and storage areas. Drums need to be stored in a containment building either indoors or with barriers and other requirements under 40 CFR 265.1100.
9. Use safe practices when handling containers to avoid injury and/or damage to containers.
10. All drums should be filled no greater the ¾ (2/3 full) full to assist in drum handling by the waste hauler.
11. Where/When available, drums should be stored on pallets for subsequent transport and disposal.

12. ***For any hazardous waste generated, ensure that it is not stored for longer than 90 days from the time that the first material is added to any container before being disposed.*** All wastes should nonetheless be disposed in a timely manner.
13. Following waste characterization and profiling, an individual authorized to sign on behalf of the waste generator (e.g., Hercules and/or Ashland) and who has the proper training will sign the manifest and keep the generator first copy (last page). The person signing the manifest will verify that all information on the manifest is correct before allowing the transporter to leave.
14. Containers of hazardous waste which are larger than 55-gal drum for all practical purpose must be monitored for VOCs around the sealed opening to ensure it is less than 500 ppm. This should be documented in the field notebook. Contact the ARCADIS Task Manager or Project Manager if this limit is exceeded to remedy the situation.

Waste Specific Guidance

Below is guidance on expected wastes associated with this work plan. This guidance shall be updated to include any additional wastes as they are generated or anticipated if possible. This will be coordinated by the waste generator.

Soil from Hand Clearing, Surface Soil Sampling, and/or Drilling

- Soil generated from all intrusive activities will be containerized in properly labeled 55-gallon metal drums and safely transported to a central staging area via a truck with a lift gate or 5-gallon plastic buckets with appropriately sealing lids via field trucks. Labeling will follow protocols discussed above for documentation. For activities that generate small quantities, soil transported in 5-gallon buckets to the central staging area will be added to existing 55-gallon metal drums. The drums will be appropriately labeled to identify all soil locations added to a specific drum and recorded in the field notebook as drums are sealed and labeled awaiting composite sampling and offsite disposal to be arranged by Ashland LLC with transport and disposal support from Nexeo Solutions LLC. Drums should be numbered with a paint pen (e.g. drum 1, drums 2, etc.) and tracked. Place a Pending Analysis label on the drum until lab results confirm whether it is hazardous or non-hazardous. The Pending Analysis label would then be replaced with a Non-Hazardous Label or Hazardous Label depending on results.

Well Development Water and Decontamination (decon) Water

- Well development/decon water should be containerized in 55-gallon metal drums and safely transported to a central staging area via a truck with a lift gate or 5-gallon plastic buckets with appropriately sealing lids via field trucks. Labeling will follow protocols discussed above for documentation. For activities that generate small quantities, soil transported in 5-gallon buckets to the central staging area will be added to existing 55-gallon metal drums. Similar to above, the drums will be appropriately labeled to identify all well locations added to a specific drum and recorded in the field notebook as drums are sealed and labeled awaiting composite sampling and offsite disposal to be arranged by EHS Support with NEXEO Solutions, Inc. Drums should be numbered with a paint pen (e.g. drum 1, drums 2, etc.) and tracked. Place a Pending Analysis label on the drum until lab results confirm whether it is hazardous or non-hazardous. The Pending Analysis label would then be replaced with a Non-Hazardous Label or Hazardous Label depending on results.

Purge Water from Wells

- Purge water from wells will be added to a 5-gallon bucket at the well site then transported via truck to the central staging area. The buckets will have appropriately sealed lids to minimize the potential of spillage enroute with plastic under the buckets to provide an extra layer of protection. The purge water

will be added to appropriately labeled 55-gallon drums in the central staging area. Similar to above, drums should be numbered with a paint pen (e.g. drum 1, drums 2, etc.) and tracked. Place a Pending Analysis label on the drum until lab results confirm whether it is hazardous or non-hazardous. The Pending Analysis label would then be replaced with a Non-Hazardous Label or Hazardous Label depending on results.

Investigation-Derived Personal Protective and Disposable Equipment and Supplies

- Materials such as latex or other gloves, disposable well sampling supplies (tubing, etc.), and any other investigation-derived expendable material will be containerized in metal 55-gallon drums at the central staging area and labeled accordingly.

Waste Analyses

Waste samples will be collected as a composite sample from each of the drums generated during intrusive activities for soil, purge water from monitoring wells, well development/decon water. PPE will be processed with the solid waste profile once analysis has been performed. One composite sample for soil and one composite sample for water will be sent to TestAmerica in Burlington, Vermont. Normal turnaround is 14 days but analyses can be expedited in approximately 4 days. Below is TestAmerica Contact Info:

Primary Coordination:
TestAmerica Savannah
5102 LaRoche Avenue
Savannah, Georgia 31404
Contact: Jerry Lanier
Phone: 912.354.7858 e.3410
Email: jerry.lanier@testamerica.com

Analytical Lab
TestAmerica Buffalo
10 Hazelwood Drive
Amherst, NY 14228
Contact: Brian Fischer
Phone: 716.504.9835
Email: brian.fischer@testamericainc.com

Alternate:
TestAmerica Burlington
30 Community Drive
Suite 11
South Burlington, VT 05403
802.660.1990 Fax: 802.660.1919
Contact: Don Dawicki
Phone: 802.660.1990
Email: don.dawicki@testamericainc.com

Solid waste samples will be analyzed for TCLP parameters established by the disposal facility. If free liquids are not evident but could be present, then also run a paint filter test.

Documentation

Copies of all waste documentation shall be maintained by the Onsite Safety Supervisor to be readily available to agencies upon request. All final copies will be maintained at Ashland/Hercules corporate headquarters at the following location:

James Vondracek
Ashland LLC.
EH&S DA-5
5200 Blazer Parkway
Dublin, Ohio 43017
jevondracek@ashland.com

Designated Waste Handling Personnel

Personnel have been RCRA DOT training to sign project waste manifests.

APPENDIX E

Amendment Specification Sheets

RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

www.rnasinc.com

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 93%

Newman Zone HRO™

A Self-Emulsifying Electron Donor

Newman Zone HRO™ is a neat-oil blend used for anaerobic bioremediation of chlorinated solvents, nitrated explosives (RDX, HMX, TNT), selected toxic metals (chrome VI), perchlorate and nitrate. Newman Zone HRO™ is easily emulsified in water on-site with gentle mixing and then injected into the subsurface. This larger droplet field emulsion improves oil retention in sand and gravel soils and fractured bedrock. Once injected the soybean oil and soybean oil esters slowly ferment to hydrogen and volatile fatty acids which support anaerobic biodegradation for as long as five years after injection.

Application

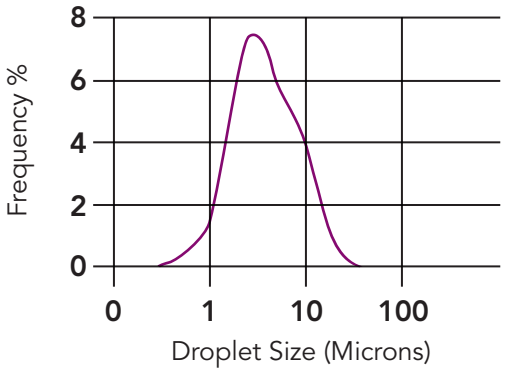
The low viscosity Newman Zone HRO™ blend can be injected into the subsurface neat and then emulsified with chase water or emulsified with low shear mixing in a tank prior to injection. After dilution in a batch mode or dilution by chase water, oil concentrations of 1% to 5% oil by volume are normally applied to each injection location. After dilution the emulsified Newman Zone HRO™ remains stable and pumps as easily as water.

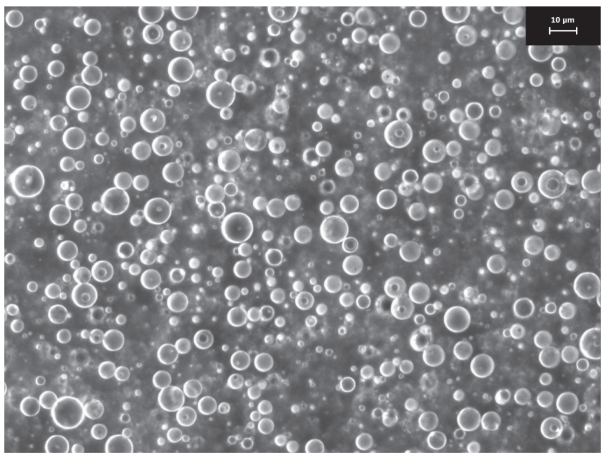
Benefits – Easily Creates a Field Emulsion

When added to water Newman Zone HRO™ will immediately bloom into an oil-in-water emulsion. Low shear mixing such as hand shaking in a vial or recirculating in a tank with a centrifugal pump will produce an emulsion with a median droplet size of about 3 microns. 90% of the droplets by volume are under 10 microns.

Benefits – Droplet Sizes that Enhance Retention in Coarse or Fractured Materials

When emulsified in the field Newman Zone HRO™ produces oil droplets that are larger than those in our factory emulsified Newman Zone™. The larger droplets are more readily retained in coarse soils and bedrock fractures and on sites with very high ground water pore velocity. Newman Zone HRO™ should not be used in soils with low permeability such as silts and clays. The small droplet Newman Zone® products provide better mobility in low permeability soils.





RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

Newman Zone HRO™

A Self-Emulsifying Electron Donor

Product Content

Chemical Name	CAS Number	Composition
Blend of Soybean Oil and Soybean Oil Esters	8001-22-7	90%
Food Grade Surfactant Blend	Proprietary	<10%

Product Characteristics

Parameter	Unit	Specification
Density	g/cm³	0.92
Flash Point	°F	>235
Appearance		Pale Amber liquid

Packaging

Newman Zone HRO™ is available in 5-gallon pails (38 pounds net) and 275-gallon totes (2,000 pounds net).

Storage

Newman Zone HRO™ may be stored on site for up to a year without refrigeration. Below freezing temperatures will not harm Newman Zone HRO™, but cold winter temperatures may cause the product to gel. Store at 40 degrees Fahrenheit or higher to maintain a low viscosity.

Safety

All components are food grade or on the Generally Recognized as Safe (GRAS) list. No protective equipment is necessary under normal use conditions.

SAFETY DATA SHEET

Newman Zone HRO

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Directives

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	***Newman Zone HRO***
SYNONYMS:	None known
CAS#:	Mixture
PRODUCT USE:	This product is used for soil and ground water remediation. It is formulated and processed using food grade additives, following packaging, sanitation and storage as required by Best Practices used for Food products.
CHEMICAL SHIPPING NAME/CLASS:	Non-Regulated Material
U.N. NUMBER:	None
MANUFACTURER'S NAME:	**RNAS Remediation Products**
ADDRESS:	6712 West River Road, Brooklyn Center, MN 55430
BUSINESS PHONE:	1-763-585-6191
EMERGENCY PHONE:	1-800-424-9300 (Chemtrec 24 Hr Service – Emergency Only)
DATE OF CURRENT REVISION:	January 16, 2016
DATE OF LAST REVISION:	April 11, 2014

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear light yellow colored liquid with a vegetable oil odor.
Health Hazards: Prolonged or repeated exposure may cause irritation to skin. May cause irritation to eyes upon contact. Inhalation of vapors/sprays or mist may cause respiratory irritation. Ingestion of large amounts of this product may cause gastrointestinal irritation.
Flammability Hazards: This product is a Non-Flammable liquid with a flash point of >235°F (>113°C).
Reactivity Hazards: None known
Environmental Hazards: The Environmental effects of this product have not been investigated. Release of this product is not anticipated to have significant adverse effects in the aquatic environment.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
		None
Non-Regulated Material	Complies with WHMIS 2015	Signal Word: **None**

CLASSIFICATION OF SUBSTANCE OR MIXTURE IN ACCORDANCE WITH 29 CFR 1910.1200 (OSHA HCS) AND THE EUROPEAN UNION DIRECTIVES:
This product does not meet the definition of a hazardous substance or preparation as defined by OSHA in 29 CFR 1910.1200 or the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.

EU HAZARD CLASSIFICATION OF INGREDIENTS PER DIRECTIVE 1272/2008/EC:
None of the ingredients are listed in Annex VI of Directive 67/548/EEC
Substances not listed either individually or in group entries must be self classified.

Component(s) Contributing to Classification(s):
All Ingredients

GHS Hazard Classification(s):
None known

Hazard Statement(s):
None known

Precautionary Statement(s):
None known

HEALTH HAZARDS OR RISKS FROM EXPOSURE:
SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of overexposure for this product are by contact with skin or eyes, inhalation of vapors and ingestion. The symptoms of overexposure are described below.
ACUTE:
INHALATION: Not expected to cause adverse health effects when used as intended. Inhalation of vapors/mist/spray may cause respiratory irritation.
CONTACT WITH SKIN: Not expected to cause adverse health effects when used as intended. Prolonged and repeated contact may cause irritation to skin.

EYE CONTACT: Direct eye contact can cause irritation with redness, tearing and blurred vision.
INGESTION: Under normal conditions of intended use, this material is not expected to be an ingestion hazard. Ingestion of large quantities may cause gastrointestinal irritation, nausea and vomiting.
CHRONIC: None known
TARGET ORGANS: Acute: Skin, Respiratory System and Eyes **Chronic:** None known

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients:	WT%	CAS#	EINECS #	GHS Hazard Classification(s)
Blend of Soybean Oil and Soybean Oil Esters	85 - 95%	8001-22-7	232-274-4	Not Classified
Proprietary Food Grade Surfactant Blend	5 – 15%	Proprietary	Not Listed in ESIS	Not Classified
Balance of other ingredients is less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).				

NOTE: This product has been classified in accordance with the hazard criteria of 29CFR1910.1200 and the SDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

4. FIRST-AID MEASURES

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.
SKIN CONTACT: Wash skin thoroughly with soap and water after handling. Seek medical attention if irritation develops and persists.
INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention.
INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or SDS with the victim to the health professional.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

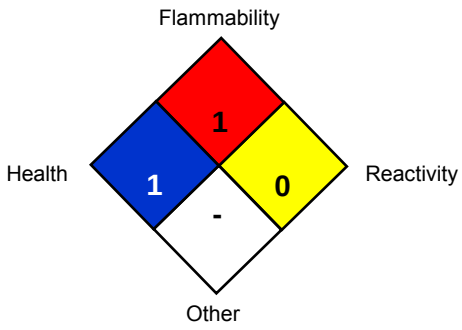
5. FIRE-FIGHTING MEASURES

FLASH POINT: Non-Flammable with flash point >235°F (>113°C)
AUTOIGNITION TEMPERATURE: Not Available
FLAMMABLE LIMITS (in air by volume, %): Lower NA Upper NA
FIRE EXTINGUISHING MATERIALS: Use fire extinguishing methods below:

Water Spray: Yes	Carbon Dioxide: Yes
Foam: Yes	Dry Chemical: Yes
Halon: Yes	Other: Any "C" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: Not considered a fire or explosion hazard. During a fire irritating gases may be produced.
Explosion Sensitivity to Mechanical Impact: No
Explosion Sensitivity to Static Discharge: No
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	1
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Stop the flow of material, if this can be done safely. Contain discharged material. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Place in a proper container for disposal. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations and those of Canada and its Provinces, those of Australia, Japan and EU Member States (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Use good hygiene practices.

STORAGE AND HANDLING PRACTICES: Store in original container. Keep container closed when not in use. Store in a cool, dry location. Avoid freezing or extended storage in high temperatures and away from incompatible materials.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

Chemical Name	CAS#	ACGIH TLV	OSHA TWA
Blend of Soybean Oil and Soybean Oil Esters	8001-22-7	10 mg/m³ Oil Mists	15 mg/m³ Oil Mists
Proprietary Food Grade Surfactant Blend	Proprietary	10 mg/m³ Oil Mists	15 mg/m³ Oil Mists

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided above.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Not required when using this product. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses or goggles are recommended to avoid eye contact. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, and the European Standard EN166, Australian Standards, or relevant Japanese Standards.

SKIN PROTECTION: Wear impervious gloves for prolonged or repeated exposure as appropriate to task avoid when using this product. If necessary, refer to U.S. OSHA 29 CFR 1910.138, the European Standard DIN EN 374, the appropriate Standards of Canada, Australian Standards, or relevant Japanese Standards.

BODY PROTECTION: Use body protection appropriate to task being performed. If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE (Physical State) and COLOR: This product is a clear light yellow colored liquid with a vegetable oil odor.
ODOR: Slight
ODOR THRESHOLD: Not Applicable
pH: Not Available
MELTING/FREEZING POINT: Not Available
BOILING POINT: Not Available
FLASH POINT: >235°F (>113°C)
EVAPORATION RATE (n-BuAc=1): Not Available
FLAMMABILITY (SOLID, GAS): Not Applicable
UPPER/LOWER FLAMMABILITY OR EXPLOSION LIMITS: Not Applicable
VAPOR PRESSURE (mm Hg @ 20°C (68°F)): Not Available
VAPOR DENSITY: Not Available
SPECIFIC GRAVITY: 0.92 @ 25°C
SOLUBILITY IN WATER: Non - Soluble
WEIGHT PER GALLON: 7.68 Lbs per gal
PARTITION COEFFICENT (n-octanol/water): Not Available
AUTO-IGNITION TEMPERATURE: Not Applicable
DECOMPOSITION TEMPERATURE: Not Available
VISCOSITY: Not Available

10. STABILITY and REACTIVITY

STABILITY: Stable under conditions of normal storage and use.
HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition products include oxides of carbon and irritating odors.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizing materials.
POSSIBILITY OF HAZARDOUS REACTIONS: Will not occur.
CONDITIONS TO AVOID: Incompatible materials.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA:
No LD50 Data available for this product.
SUSPECTED CANCER AGENT: Ingredients within this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, or CAL/OSHA and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.
IRRITANCY OF PRODUCT: No specific data available
SENSITIZATION TO THE PRODUCT: This product is not a skin and respiratory sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No specific data available on this product.
CHEMICAL EFFECT ON PLANTS, ANIMALS AND AQUATIC LIFE: This product is not expected to cause significant harm to plants, animals or aquatic life.
WATER ENDANGERMENT CLASS: Water endangering in accordance with EU Guideline 91/155-EWG – Not Determined.
SPECIFIC AVAILABLE COMPONENT INFORMATION: No additional data available at this time.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

EU Waste Code: Not determined.

14. TRANSPORTATION INFORMATION

US DOT, IATA, IMO, ADR:

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS: This product is classified (per 49 CFR 172.101) by the U.S. Department of Transportation, as follows:

PROPER SHIPPING NAME:	Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION:	None
UN IDENTIFICATION NUMBER:	None
PACKING GROUP:	NA
DOT LABEL(S) REQUIRED:	None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER: None

RQ QUANTITY: None

MARINE POLLUTANT: The components of this product are not designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is not considered as dangerous goods.

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is not considered as dangerous goods.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not considered by the United Nations Economic Commission for Europe to be dangerous goods.

15. REGULATORY INFORMATION

UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act as follows: None.

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal SDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None.

U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory or are exempted from listing.

OTHER U.S. FEDERAL REGULATIONS: None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Ingredients within this product are not on the Proposition 65 Lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory, or are exempted from listing.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all of the information required by those regulations.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: Complies with WHMIS 2015.

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

This product does not meet the definition of a hazardous substance or preparation as defined by the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.
See Section 2 for Details.

AUSTRALIAN INFORMATION FOR PRODUCT: The components of this product are listed on the International Chemical Inventory list.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

JAPANESE ENCS INVENTORY: The components of this product are on the ENCS Inventory as indicated in the section on International Chemical Inventories, below.

POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW: No component of this product is a listed Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:
Asia-Pac: Listed or Exempt from listing
Australian Inventory of Chemical Substances (AICS): Listed or Exempt from listing
Korean Existing Chemicals List (ECL): Listed or Exempt from listing
Japanese Existing National Inventory of Chemical Substances (ENCS): Listed or Exempt from listing
Philippines Inventory if Chemicals and Chemical Substances (PICCS): Listed or Exempt from listing
Swiss Giftliste List of Toxic Substances: Listed or Exempt from listing
U.S. TSCA: Listed

16. OTHER INFORMATION

ABBREVIATIONS AND ACRONYMS:

EPA: United States Environmental Protection Agency
ARD: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)

PREPARED BY: Paul Eigbrett – (**GHS MSDS Compliance PLUS)**
DATE OF PRINTING: January 16, 2016

The information contained herein is believed to be accurate but is not warranted to be so. Data and calculations are based on information furnished by the manufacturer of the product and manufacturers of the components of the product. Users are advised to confirm in advance of the need that information is current, applicable and suited to the circumstances of use. RNAS Remediation Products assumes no responsibility for injury to vendee or third party person proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Furthermore, RNAS Remediation Products assumes no responsibility for injury caused by abnormal use of this material even if reasonable safety procedures are followed.

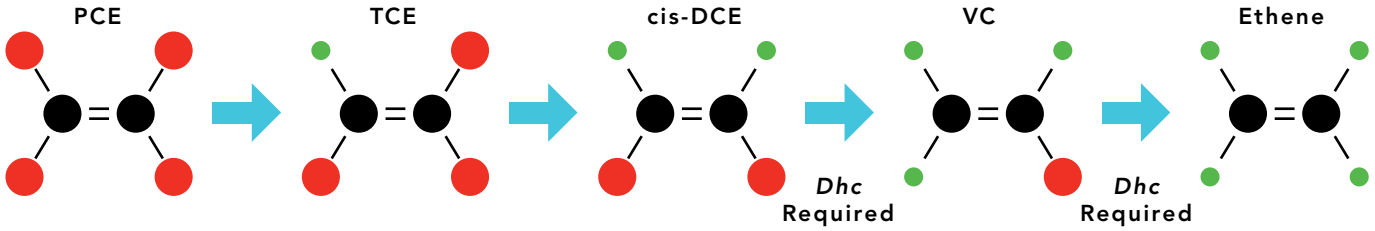
END OF SDS SHEET

RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

SDC-9

Bioaugmentation Culture for Groundwater Remediation

SDC-9™ is a field proven, highly effective consortium of microorganisms for in situ bioremediation of chlorinated solvents. SDC-9 contains multiple strains of *Dehalococcoides mccartyi* (*Dhc*), the only species known to completely biodegrade PCE and TCE to non-toxic ethene. For sites where *Dhc* are absent or present at low concentrations bioaugmentation provides the necessary bacteria for complete dechlorination. Even when *Dhc* is present bioaugmentation can provide substantial benefits by increasing dechlorination rates, using electron donor more efficiently and reaching site closure sooner.



Benefits - Higher Dechlorination Rates

SDC-9 contains a natural consortium of bacteria that includes not only dechlorinating microbes but other beneficial bacteria that support *Dhc* growth by supplying required substrates and growth factors. "*Dhc* in mixed cultures exhibit shorter lag times following transfers, grow faster and exhibit higher dechlorination rates than pure *Dhc* cultures" (Bioaugmentation for Groundwater Remediation, 2013).

Benefits - Low pH Tolerant

SDC-9 continues to perform at pH levels as low as 5.5 (Vainberg and Steffan, 2014), although pH levels above 6.0 are recommended for more effective dechlorination.

Application

SDC-9 is commonly injected between rounds of anaerobic water and electron donor, which minimizes exposure to oxygen while mixing SDC-9 throughout the treatment area. Recommended dosing for SDC-9 is $1x10^7$ *Dhc* cells per liter in target zones (Lu et al., 2006).

Contaminants Treated by SDC-9:

Tetrachloroethene (PCE)
Trichloroethene (TCE)
cis-Dichloroethene (cDCE)
trans-Dichloroethene (tDCE)
1,1-Dichloroethene (DCE)
Vinyl Chloride (VC)
Freon 11
Freon 113
1,1,2,2-Tetrachloroethane (TeCA)
1,1,1-Trichloroethane (TCA)
1,1-Dichloroethane (DCA)
Carbon Tetrachloride (CT)
Chloroform (CF)
Dichloromethane (DCM)
Hydrochlorofluorocarbon (HCFC)
Tetrafluoroethene (TFE)

SDC-9 Contains:

Dehalococcoides mccartyi
Dehalogenimonas spp.
Desulfovibrio spp.
Desulfitobacterium spp.
Methanogenic bacteria
Sulfate Reducing bacteria

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SDC-9

Bioaugmentation Culture for Groundwater Remediation

Product Characteristics

Parameter	Unit	Specification
Cell Count	*Dhc* Cells/Liter	>1 x 10^{11}
Density	g/cm^3	0.9 - 1.1
pH	Standard Units	6.0 - 8.0
Appearance		Light Greenish, Murky Liquid
Odor		Musty

Packaging

SDC-9 is shipped in 19L stainless steel kegs. Kegs are pressurized with Nitrogen and stored in chilled coolers. Calibrated delivery system (1, 2 or 3.5 L) and fittings are provided. Users will need to provide an inert gas cylinder (Nitrogen or Argon) and regulator.

Storage

Keep containers tightly closed in a cool, well-ventilated area. SDC-9 may be stored for up to 3 weeks at temperature 2-4° C. Avoid freezing conditions. Avoid exposure to oxygen.

Safety

SDC-9 is a non-toxic, non-pathogenic, non-genetically modified, naturally occurring consortium of microbes. No known hazards are associated with exposure to this product. Nevertheless, appropriate Personal Protective Equipment is recommended when handling this product.

SAFETY DATA SHEET

SDC-9

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Directives

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	***SDC-9***
SYNONYMS:	None known
CAS#:	Mixture
PRODUCT USE:	This product is used for soil and ground water remediation.
CHEMICAL SHIPPING NAME/CLASS:	Non-Regulated Material
U.N. NUMBER:	None
MANUFACTURER'S NAME:	**CB&I**
ADDRESS:	17 Princess Road, Lawrencevill, NJ 08648
BUSINESS PHONE:	1-609-895-5340
SUPPLIER'S NAME:	**RNAS Remediation Products**
ADDRESS:	6712 West River Road, Brooklyn Center, MN 55430
BUSINESS PHONE:	1-763-585-6191
EMERGENCY PHONE:	1-800-424-9300 (Chemtrec 24 Hr Service – Emergency Only)
DATE OF CURRENT REVISION:	April 22, 2016
DATE OF LAST REVISION:	New

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a light greenish murky liquid with a musty odor.
Health Hazards: Not expected to cause adverse health effects when used as intended. Prolonged or repeated exposure may cause irritation to skin. May cause irritation to eyes upon contact. Inhalation of vapors/sprays or mist may cause respiratory irritation. Ingestion of large amounts of this product may cause gastrointestinal irritation.
Flammability Hazards: This product is a Non-Flammable liquid.
Reactivity Hazards: None known
Environmental Hazards: The Environmental effects of this product have not been investigated. Release of this product is not anticipated to have significant adverse effects in the aquatic environment.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
		None
Non-Regulated Material	Complies with WHMIS 2015	Signal Word: **None**

GHS LABELING AND CLASSIFICATION:
This product does not meet the definition of a hazardous substance or preparation as defined by 29CFR 1910.1200 or the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.

EU HAZARD CLASSIFICATION OF INGREDIENTS PER DIRECTIVE 1272/2008/EC:
None of the ingredients are listed in Annex VI
Substances not listed either individually or in group entries must be self classified.

Component(s) Contributing to Classification(s)
All Ingredients

GHS Hazard Classification(s):
None known

Hazard Statement(s):
None known

Precautionary Statement(s):
None known

HEALTH HAZARDS OR RISKS FROM EXPOSURE:
SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of overexposure for this product are by contact with skin or eyes, inhalation of vapors and ingestion. The symptoms of overexposure are described below.
ACUTE:
INHALATION: Not expected to cause adverse health effects when used as intended. Inhalation of vapors/mist/spray may cause respiratory irritation.
CONTACT WITH SKIN: Not expected to cause adverse health effects when used as intended. Prolonged and repeated contact may cause irritation to skin.
EYE CONTACT: Direct eye contact can cause irritation with redness, tearing and blurred vision.

INGESTION: Under normal conditions of intended use, this material is not expected to be an ingestion hazard. Ingestion of large quantities may cause gastrointestinal irritation, nausea and vomiting.
CHRONIC: None known

TARGET ORGANS: Acute: Skin, Respiratory System and Eyes **Chronic:** None known

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients:	WT%	CAS#	EINECS #	GHS Hazard Classification(s)
Non-toxic, naturally occurring, non-pathogenic, non-genitically altered anaerobic microbes in a water-based medium	100%	Not available	Not available	None
Balance of other ingredients is less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).				

NOTE: This product has been classified in accordance with the hazard criteria of 29CFR1910.1200 and the SDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

4. FIRST-AID MEASURES

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.
SKIN CONTACT: Wash skin thoroughly with soap and water after handling. Seek medical attention if irritation develops and persists.
INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention.
INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or SDS with the victim to the health professional.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

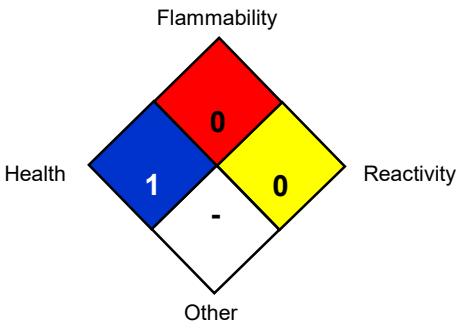
5. FIRE-FIGHTING MEASURES

FLASH POINT: Non-Flammable
AUTOIGNITION TEMPERATURE: Not Available
FLAMMABLE LIMITS (in air by volume, %): Lower NA Upper NA
FIRE EXTINGUISHING MATERIALS: Use fire extinguishing methods below:

Water Spray: Yes	Carbon Dioxide: Yes
Foam: Yes	Dry Chemical: Yes
Halon: Yes	Other: Any "C" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: Not considered a fire or explosion hazard.
Explosion Sensitivity to Mechanical Impact: No
Explosion Sensitivity to Static Discharge: No
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Stop the flow of material, if this can be done safety. Contain discharged material. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Place in a proper container for disposal. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations and those of Canada and its Provinces, those of Australia, Japan and EU Member States (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Use good hygiene practices.

STORAGE AND HANDLING PRACTICES: Store in original container. Keep container closed when not in use. Store in a cool, dry location. Avoid freezing or extended storage in high temperatures and away from incompatible materials. Do not exceed pressure of 15 psi during transfer of SDC-9 from kegs. Don't open keg when contents are under pressure.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

Chemical Name	CAS#	ACGIH TLV	OSHA TWA
Non-toxic, naturally occurring, non-pathogenic, non-genitically altered anaerobic microbes in a water-based medium	Not available	Not Listed	Not Listed

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided above.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Not required when using this product. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses or goggles are recommended to avoid eye contact. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, and the European Standard EN166, Australian Standards, or relevant Japanese Standards.

SKIN PROTECTION: Wear impervious gloves for prolonged or repeated exposure as appropriate to task when using this product. If necessary, refer to U.S. OSHA 29 CFR 1910.138, the European Standard DIN EN 374, the appropriate Standards of Canada, Australian Standards, or relevant Japanese Standards.

BODY PROTECTION: Use body protection appropriate to task being performed. If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE (Physical State) and COLOR: This product is a light greenish murky liquid with a musty odor.
ODOR: Musty odor
ODOR THRESHOLD: Not Applicable
pH: 6.0 – 8.0
MELTING/FREEZING POINT: 0°C (water)
BOILING POINT: 100°C (water)
FLASH POINT: Not Available
EVAPORATION RATE (n-BuAc=1): 0.9-1.1
FLAMMABILITY (SOLID, GAS): Not Applicable
UPPER/LOWER FLAMMABILITY OR EXPLOSION LIMITS: Not Available
VAPOR PRESSURE (mm Hg @ 20°C (68°F): 24mm Hg (water)
VAPOR DENSITY: Not Available
SPECIFIC GRAVITY: 0.9-1.1
SOLUBILITY IN WATER: Soluble in water
WEIGHT PER GALLON: 7.5 – 9.2 lbs/gal
PARTITION COEFFICENT (n-octanol/water): Not Available
AUTO-IGNITION TEMPERATURE: Not Available
DECOMPOSITION TEMPERATURE: Not Available
VISCOSITY: Not Available

10. STABILITY and REACTIVITY

STABILITY: Stable under conditions of normal storage and use.
HAZARDOUS DECOMPOSITION PRODUCTS: None
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Water-reactive materials.
POSSIBILITY OF HAZARDOUS REACTIONS: Will not occur.
CONDITIONS TO AVOID: None

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA:
No LD50 Data available for this product.
*Note: This product has tested negative for pathogenic microorganisms such as bacillius cereus, listeria monocytogens, salmonella sp., fecal coliform, total coliform, yeast and mold and pseudomonas sp.
SUSPECTED CANCER AGENT: Ingredients within this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, or CAL/OSHA and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.
IRRITANCY OF PRODUCT: No specific data available
SENSITIZATION TO THE PRODUCT: This product is not a skin and respiratory sensitizer
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
TOXICITY DATA:
No data available for this product.
ENVIRONMENTAL STABILITY: This material will degrade in the environment.
CHEMICAL EFFECT ON PLANTS, ANIMALS AND AQUATIC LIFE: This product is not expected to cause significant harm to plants, animals or aquatic life.
WATER ENDANGERMENT CLASS: Water endangering in accordance with EU Guideline 91/155-EWG – Not Determined.
SPECIFIC AVAILABLE COMPONENT INFORMATION: No additional data available at this time.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan. To permanently inactivate microorganisms and reduce odors, mix 100 parts SDC-9 with 1 part bleach.
EU Waste Code: Not determined

14. TRANSPORTATION INFORMATION

US DOT, IATA, IMO, ADR:

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS: This product is classified (per 49 CFR 172.101) by the U.S. Department of Transportation, as follows.

PROPER SHIPPING NAME:	Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION:	None
UN IDENTIFICATION NUMBER:	None
PACKING GROUP:	NA
DOT LABEL(S) REQUIRED:	None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER: None
RQ QUANTITY: None
MARINE POLLUTANT: The components of this product are not designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is not considered as dangerous goods.

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is not considered as dangerous goods.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not considered by the United Nations Economic Commission for Europe to be dangerous goods.

15. REGULATORY INFORMATION

UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act as follows: None
U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal SDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.
U.S. CERCLA REPORTABLE QUANTITY (RQ): None
U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory or are exempted from listing.
OTHER U.S. FEDERAL REGULATIONS: None
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Ingredients within this product are not on the Proposition 65 Lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory, or are exempted from listing.
OTHER CANADIAN REGULATIONS: Not applicable.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all of the information required by those regulations.
CANADIAN WHMIS CLASSIFICATION and SYMBOLS: Complies with WHMIS 2015

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

This product does not meet the definition of a hazardous substance or preparation as defined by the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.
See Section 2 for Details

AUSTRALIAN INFORMATION FOR PRODUCT: The components of this product are listed on the International Chemical Inventory list.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

JAPANESE ENCS INVENTORY: The components of this product are on the ENCS Inventory as indicated in the section on International Chemical Inventories, below.

POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW: No component of this product is a listed Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:
Asia-Pac: Listed or Exempt from listing
Australian Inventory of Chemical Substances (AICS): Listed or Exempt from listing
Korean Existing Chemicals List (ECL): Listed or Exempt from listing
Japanese Existing National Inventory of Chemical Substances (ENCS): Listed or Exempt from listing
Philippines Inventory of Chemicals and Chemical Substances (PICCS): Listed or Exempt from listing
Swiss Giftliste List of Toxic Substances: Listed or Exempt from listing
U.S. TSCA: Listed

16. OTHER INFORMATION

ABBREVIATIONS AND ACRONYMS:

EPA: United States Environmental Protection Agency
ARD: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)

PREPARED BY: Chris Eigbrett – (**MSDS to GHS Compliance)**
DATE OF PRINTING: April 22, 2016

END OF SDS SHEET

RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

www.rnasinc.com

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 99%

MicroBlend

A Blend of Vitamin B12 and Yeast Extract

MicroBlend™ is an easy to use vitamin B12 and yeast extract product containing over 55 mg/Kg of vitamin B12 and 37.5% yeast extract. MicroBlend™ stimulates microbial activity with micronutrients, vitamins and other cofactors that are not commonly found in simple substrates such as sodium lactate or emulsified vegetable oil. Adding MicroBlend™ stimulates rapid microbial growth of indigenous microbes at sites with micronutrient limitations. Sites utilizing bioaugmentation benefit from rapidly establishing a healthy population of the injected microbes.

Application

MicroBlend™ is mixed with an electron donor amendment and injected below the water table after dilution. Laboratory microcosm studies suggest concentrations of B12 of 0.025 mg/L provide the maximum stimulation of Dehaloccoicoides microbial growth. The dose response of yeast extract is less established but typical blends in Newman Zone® emulsion would use 1.0% to 1.5% yeast extract on a dry weight basis.

Benefits – Easily Used in the Field

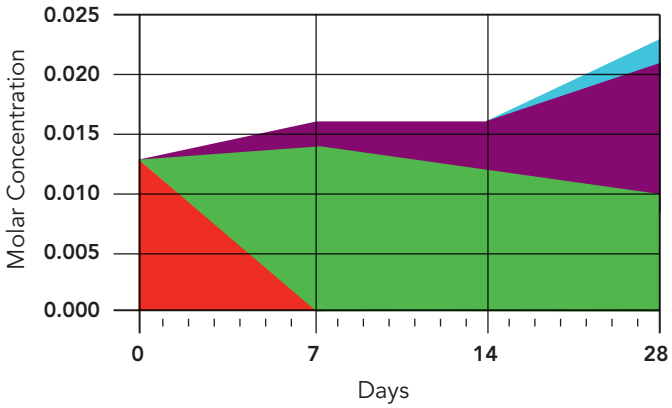
MicroBlend™ is an easy to blend liquid containing yeast extract and vitamin B12. A liquid nutrient formulation avoids the problems of dust and the difficulty of wetting a hydrophobic dry yeast extract powder.

Benefits – Pre-Measured Dosing

Each box of MicroBlend™ contains 1 gram of vitamin B12 and 15 pounds of dry yeast extract. Each box is divided into two 20 pound bags allowing the nutrients to be added in increments of 7.5 pounds of dry yeast extract and 0.5 gram increments of vitamin B12.

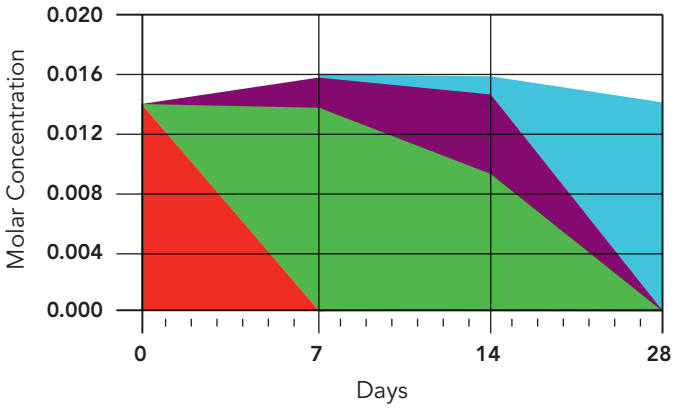
GOOD - SIMPLE DONOR + MICROBES

Sodium Lactate + KB-1



BEST - COMPLEX DONOR + MICROBES + MicroBlend

Newman Zone QR + MicroBlend + KB-1



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(763) 585.6191 www.RNASinc.com

www.rnasinc.com

MicroBlend

A Blend of Vitamin B12 and Yeast Extract

Product Content

Chemical Name	CAS Number	Composition
Yeast Extract (Food Grade)	8013-01-2	37.5%
Cyanocobalamin (Vitamin B12)	68-19-9	55 mg/Kg - (1 gram in 40 lbs)
Water	7732-18-5	63%

Product Characteristics

Parameter	Unit	Specification
Density	g/cm^3	1.11
Appearance		Medium Brown Slurry

Packaging

MicroBlend™ is packaged in 20 pound bags, two bags to a box, for forty pounds of net product. Each box contains 1 gram of vitamin B12 and 15 pounds of dry yeast extract.

Storage

MicroBlend™ is pasteurized and kept frozen in our warehouse until needed which ensures a virtually unlimited shelf-life. Once thawed the pasteurized liquid in sealed bags can be kept on site without refrigeration for up to two months without risk of spoilage.

Safety

MicroBlend™ is a low hazard food grade material. No protective equipment is necessary under normal use conditions.

SAFETY DATA SHEET

MicroBlend™

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Directives

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	***MicroBlend™***
SYNONYMS:	None known
CAS#:	Mixture
PRODUCT USE:	MicroBlend™ stimulates microbial activity with micronutrients, vitamins and other cofactors that are not commonly found in simple substrates such as sodium lactate or emulsified vegetable oil.
CHEMICAL SHIPPING NAME/CLASS:	Non-Regulated Material
U.N. NUMBER:	None
MANUFACTURER'S NAME:	**RNAS Remediation Products**
ADDRESS:	6712 West River Road, Brooklyn Center, MN 55430
BUSINESS PHONE:	1-763-585-6191
EMERGENCY PHONE:	1-800-424-9300 (Chemtrec 24 Hr Service – Emergency Only)
DATE OF CURRENT REVISION:	January 16, 2016
DATE OF LAST REVISION:	June 11, 2014

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a medium brown slurry (liquid) with a slight odor.
Health Hazards: Not expected to cause adverse health effects when used as intended. Prolonged or repeated exposure may cause irritation to skin. Possible allergic vitamin B12 reaction. May cause irritation to eyes upon contact. Inhalation of vapors/sprays or mist may cause respiratory irritation. Ingestion of large amounts of this product may cause gastrointestinal irritation.
Flammability Hazards: This product is Non-Flammable liquid.
Reactivity Hazards: None known.
Environmental Hazards: The Environmental effects of this product have not been investigated. Release of this product is not anticipated to have significant adverse effects in the aquatic environment.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
		None
Non-Regulated Material	"Not Controlled"	Signal Word: **None**

CLASSIFICATION OF SUBSTANCE OR MIXTURE IN ACCORDANCE WITH 29 CFR 1910.1200 (OSHA HCS) AND THE EUROPEAN UNION DIRECTIVES:
This product does not meet the definition of a hazardous substance or preparation as defined by OSHA in 29 CFR 1910.1200 or the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.

EU HAZARD CLASSIFICATION OF INGREDIENTS PER DIRECTIVE 1272/2008/EC:
None of the ingredients are listed in Annex VI of Directive 67/548/EEC
Substances not listed either individually or in group entries must be self classified.

Component(s) Contributing to Classification(s):
All Ingredients

GHS Hazard Classification(s):
None known

Hazard Statement(s):
None known

Precautionary Statement(s):
None known

HEALTH HAZARDS OR RISKS FROM EXPOSURE:
SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of overexposure for this product are by contact with skin or eyes, inhalation of vapors and ingestion. The symptoms of overexposure are described below.
ACUTE:
INHALATION: Not expected to cause adverse health effects when used as intended. Inhalation of vapors/mist/spray may cause respiratory irritation.
CONTACT WITH SKIN: Not expected to cause adverse health effects when used as intended. Prolonged and repeated contact may cause irritation to skin.

EYE CONTACT: Direct eye contact can cause irritation with redness, tearing and blurred vision.
INGESTION: Under normal conditions of intended use, this material is not expected to be an ingestion hazard. Ingestion of large quantities may cause gastrointestinal irritation, nausea and vomiting.
CHRONIC: None known

TARGET ORGANS: Acute: Skin, Respiratory System and Eyes **Chronic:** None known

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients:	WT%	CAS#	EINECS #	GHS Hazard Classification(s)
Water	60 - 65%	7732-18-5	231-791-2	Not Classified
Yeast Extract (Food Grade)	35 – 40%	8013-01-2	232-387-9	Not Classified
Cyanocabalamin (Vitamin B-12)	0.006%	68-19-9	200-680-0	Not Classified
Balance of other ingredients is less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).				

NOTE: This product has been classified in accordance with the hazard criteria of 29CFR1910.1200 and the SDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

4. FIRST-AID MEASURES

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.
SKIN CONTACT: Wash skin thoroughly with soap and water after handling. Seek medical attention if irritation develops and persists.
INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention.
INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or SDS with the victim to the health professional.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

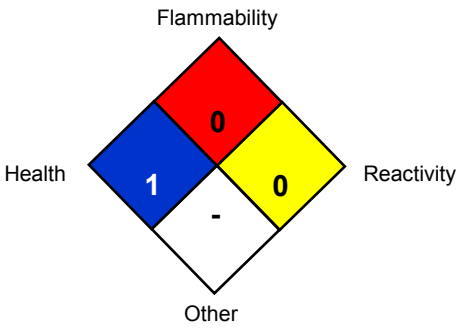
5. FIRE-FIGHTING MEASURES

FLASH POINT: Non-Flammable.
AUTOIGNITION TEMPERATURE: Not Applicable.
FLAMMABLE LIMITS (in air by volume, %): Lower NA Upper NA
FIRE EXTINGUISHING MATERIALS: Use fire extinguishing methods below:

Water Spray: Yes	Carbon Dioxide: Yes
Foam: Yes	Dry Chemical: Yes
Halon: Yes	Other: Any "C" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: Not considered a fire or explosion hazard.
Explosion Sensitivity to Mechanical Impact: No
Explosion Sensitivity to Static Discharge: No
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Stop the flow of material, if this can be done safely. Contain discharged material. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Place in a proper container for disposal. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations and those of Canada and its Provinces, those of Australia, Japan and EU Member States (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Use good hygiene practices.

STORAGE AND HANDLING PRACTICES: Store in original container. Keep container closed when not in use. Store in a cool, dry location. Avoid freezing or extended storage in high temperatures and away from incompatible materials.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

Chemical Name	CAS#	ACGIH TLV	OSHA TWA
Water	7732-18-5	Not Listed	Not Listed
Yeast Extract (Food Grade)	8013-01-2	Not Listed	Not Listed
Cyanocabalamin (Vitamin B-12)	68-19-9	Not Listed	Not Listed

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided above.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Not required when using this product. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses or goggles are recommended to avoid eye contact. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, and the European Standard EN166, Australian Standards, or relevant Japanese Standards.

SKIN PROTECTION: Wear impervious gloves for prolonged or repeated exposure as appropriate to task when using this product. If necessary, refer to U.S. OSHA 29 CFR 1910.138, the European Standard DIN EN 374, the appropriate Standards of Canada, Australian Standards, or relevant Japanese Standards.

BODY PROTECTION: Use body protection appropriate to task being performed. If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE (Physical State) and COLOR: This product is a medium brown slurry (liquid) with a slight odor.
ODOR: Mild
ODOR THRESHOLD: Not Applicable
pH: 4.5 – 5.5
MELTING/FREEZING POINT: Not Available
BOILING POINT: Not Available
FLASH POINT: Not Applicable
EVAPORATION RATE (n-BuAc=1): Not Available
FLAMMABILITY (SOLID, GAS): Not Applicable
UPPER/LOWER FLAMMABILITY OR EXPLOSION LIMITS: Not Available
VAPOR PRESSURE (mm Hg @ 20°C (68°F)): Not Available
VAPOR DENSITY: Not Available
SPECIFIC GRAVITY: 1.11 @ 25°C
SOLUBILITY IN WATER: Dispersible in water
WEIGHT PER GALLON: 9.25 lbs/gal
PARTITION COEFFICENT (n-octanol/water): Not Available
AUTO-IGNITION TEMPERATURE: Not Available
DECOMPOSITION TEMPERATURE: Not Available
VISCOSITY: Not Available

10. STABILITY and REACTIVITY

STABILITY: Stable under conditions of normal storage and use.
HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition products include oxides of carbon.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizing materials and acids.
POSSIBILITY OF HAZARDOUS REACTIONS: Will not occur.
CONDITIONS TO AVOID: Incompatible materials

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA:
No LD50 Data Available
SUSPECTED CANCER AGENT: Ingredients within this product are found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, or CAL/OSHA and therefore are considered to be, or suspected to be, cancer-causing agents by these agencies.
CAS# 68-19-9:
• ACGIH: Not listed.
• California: Not listed.
• NTP: Not listed.
• IARC: Group 2B carcinogen (listed as Cobalt compounds)
IRRITANCY OF PRODUCT: No specific data available.
SENSITIZATION TO THE PRODUCT: This product is not a skin and respiratory sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No specific data available on this product.
CHEMICAL EFFECT ON PLANTS, ANIMALS AND AQUATIC LIFE: This product is not expected to cause significant harm to plants, animals or aquatic life.
WATER ENDANGERMENT CLASS: Water endangering in accordance with EU Guideline 91/155-EWG – Not Determined.
SPECIFIC AVAILABLE COMPONENT INFORMATION: No additional data available at this time.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.
EU Waste Code: Not determined

14. TRANSPORTATION INFORMATION

US DOT, IATA, IMO, ADR:

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS: This product is classified (per 49 CFR 172.101) by the U.S. Department of Transportation, as follows.

PROPER SHIPPING NAME:	Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION:	None
UN IDENTIFICATION NUMBER:	None
PACKING GROUP:	NA
DOT LABEL(S) REQUIRED:	None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER: None
RQ QUANTITY: None
MARINE POLLUTANT: The components of this product are not designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is not considered as dangerous goods.

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is not considered as dangerous goods.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not considered by the United Nations Economic Commission for Europe to be dangerous goods.

15. REGULATORY INFORMATION

UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act as follows:
This material contains Cyanocobalamin (listed as Cobalt compounds), <0.006%, (CAS# 68-19-9) which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal SDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.
U.S. CERCLA REPORTABLE QUANTITY (RQ): None.
U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory or are exempted from listing.
OTHER U.S. FEDERAL REGULATIONS: None.
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Ingredients within this product are not on the Proposition 65 Lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory, or are exempted from listing.
OTHER CANADIAN REGULATIONS: Not applicable.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all of the information required by those regulations.
CANADIAN WHMIS CLASSIFICATION and SYMBOLS: Complies with WHMIS 2015

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

This product does not meet the definition of a hazardous substance or preparation as defined by the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.
See Section 2 for Details.

AUSTRALIAN INFORMATION FOR PRODUCT: The components of this product are listed on the International Chemical Inventory list.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

JAPANESE ENCS INVENTORY: The components of this product are on the ENCS Inventory as indicated in the section on International Chemical Inventories, below.

POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW: No component of this product is a listed Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:
Asia-Pac: Listed or Exempt from listing
Australian Inventory of Chemical Substances (AICS): Listed or Exempt from listing
Korean Existing Chemicals List (ECL): Listed or Exempt from listing
Japanese Existing National Inventory of Chemical Substances (ENCS): Listed or Exempt from listing
Philippines Inventory if Chemicals and Chemical Substances (PICCS): Listed or Exempt from listing
Swiss Giftliste List of Toxic Substances: Listed or Exempt from listing
U.S. TSCA: Listed

16. OTHER INFORMATION

ABBREVIATIONS AND ACRONYMS:

EPA: United States Environmental Protection Agency
ARD: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)

PREPARED BY: Paul Eigbrett – (**GHS MSDS Compliance PLUS)**
DATE OF PRINTING: January 16, 2016

END OF SDS SHEET

RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

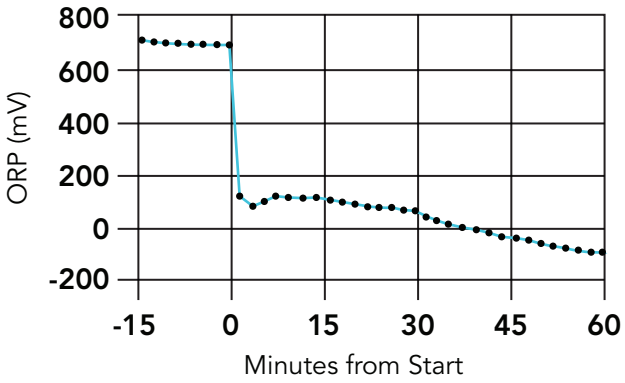
www.rnasinc.com

Newman Zone OS™

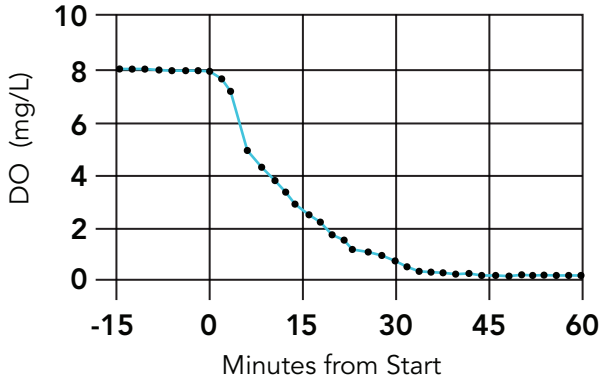
Oxygen Scavenger for Anaerobic Bioremediation

Newman Zone OS™ is a blend of food grade antioxidants, chelated ferrous iron catalyst and buffering agents used to prepare water for anaerobic injections. Newman Zone OS™ is specially formulated to quickly remove dissolved oxygen from water and create the reducing conditions necessary for successful anaerobic bioremediation. Newman Zone OS™ supports bioaugmentation cultures such as SDC-9™ and KB-1® by removing dissolved oxygen from injection water and allowing bacteria to thrive and grow.

ORP REDUCTION*



DISSOLVED OXYGEN REMOVAL*



*Tested in 1,000 Liter totes at 16° C

Application

Newman Zone OS™ comes in pre-measured foil pouches and is added to tanks prior to filling with water. For optimal results, stirring tanks with pumps or mixers is recommended until Newman Zone OS™ is fully dissolved. Typical applications result in anoxic water within one hour and a negative ORP within two hours.

Benefits - Added Vitamin B12

Newman Zone OS™ contains 25 µg/liter of Vitamin B12 (as applied), a required corrinoid vitamin demonstrated to enhance growth and dechlorination performance of Dehalococcoides strains (He et al., May 2007).

Benefits - Rapid Oxygen Scavenging

Newman Zone OS™ is a cost effective way to quickly prepare anaerobic water. Due to its high concentration of antioxidants, chelated ferrous iron catalyst and buffering agents, Newman Zone OS™ is effective even in cold, highly oxidized water. Higher temperatures will result in faster oxygen removal rates.

Benefits - Supports Bioaugmentation Cultures

Laboratory microcosm studies have confirmed Newman Zone OS™ presents no toxicity or inhibition to the SDC-9™ bioaugmentation culture. Additionally, the antioxidants and chelating agents degrade to provide a rapidly available electron donor (700 mg/liter glucose equivalent).

RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

Newman Zone OS™

Oxygen Scavenger for Anaerobic Bioremediation

Product Content

Chemical Name	Composition
Food Grade Antioxidants	70%
Food Grade Catalysts, Chelating Agents and Buffers	30%

Product Characteristics

Parameter	Unit	Specification
Appearance, packaged		White to brown powder or granules
Appearance, in solution		Dark grey to brown or yellow
Density	g/cm^3	1.0 - 1.2
pH, in solution	Standard Units	7.0 - 8.0

Packaging

Newman Zone OS™ is packaged in foil pouches and premeasured for 275 gallon (1,000 L) and 1,000 gallon (3,785 L) batches. Larger package sizes are available upon request.

Storage

Newman Zone OS™ may be stored under recommended conditions for months without activity loss. Keep containers tightly closed in a cool, well-ventilated area. Keep foil bags sealed to avoid exposure to oxygen or moisture.

Safety

Newman Zone OS™ is comprised of food grade, non-toxic ingredients. No known hazards are associated with exposure to this product. Nevertheless, appropriate personal protective equipment is recommended when handling this product.

SAFETY DATA SHEET

Newman Zone OS

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Directives

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	**Newman Zone OS**
SYNONYMS:	Newman Zone Oxygen Scavenger
CAS#:	Mixture
PRODUCT USE:	This product is used to deoxygenate water for anaerobic subsurface injections.
CHEMICAL SHIPPING NAME/CLASS:	Non-Regulated Material
U.N. NUMBER:	None
MANUFACTURER'S NAME:	**RNAS Remediation Products**
ADDRESS:	6712 West River Road, Brooklyn Center, MN 55430
BUSINESS PHONE:	1-763-585-6191
EMERGENCY PHONE:	1-800-424-9300 (Chemtrec 24 Hr Service – Emergency Only)
DATE OF CURRENT REVISION:	July 19, 2016
DATE OF LAST REVISION:	New

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white and brownish-yellow powder with a mild, sweet odor.
Health Hazards: Not expected to cause adverse health effects when used as intended. Prolonged or repeated exposure may cause irritation to skin. May cause irritation to eyes upon contact. Inhalation may cause respiratory irritation. Ingestion of large amounts of this product may cause gastrointestinal irritation.
Flammability Hazards: This product is a Non-Flammable powder.
Reactivity Hazards: None known
Environmental Hazards: The Environmental effects of this product have not been investigated. Release of this product is not anticipated to have significant adverse effects in the aquatic environment.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
		None
Non-Regulated Material	Complies with WHMIS 2015	Signal Word: **None**

GHS LABELING AND CLASSIFICATION:
This product does not meet the definition of a hazardous substance or preparation as defined by 29CFR 1910.1200 or the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.

EU HAZARD CLASSIFICATION OF INGREDIENTS PER DIRECTIVE 1272/2008/EC:
None of the ingredients are listed in Annex VI
Substances not listed either individually or in group entries must be self classified.

Component(s) Contributing to Classification(s):
All Ingredients

GHS Hazard Classification(s):
Not applicable

Hazard Statement(s):
Not applicable

Response Statement(s):
Not applicable

Prevention Statement(s):
Not applicable

Storage Statement(s):
Not applicable

Disposal Statement(s):
Not applicable

HEALTH HAZARDS OR RISKS FROM EXPOSURE:
SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of overexposure for this product are by contact with skin or eyes, inhalation of vapors and ingestion. The symptoms of overexposure are described below.
ACUTE:
INHALATION: Not expected to cause adverse health effects when used as intended. Inhalation of vapors/mist/spray may cause respiratory irritation.
CONTACT WITH SKIN: Not expected to cause adverse health effects when used as intended. Prolonged and repeated contact may cause irritation to skin.
EYE CONTACT: Direct eye contact can cause irritation with redness, tearing and blurred vision.

INGESTION: Under normal conditions of intended use, this material is not expected to be an ingestion hazard. Ingestion of large quantities may cause gastrointestinal irritation, nausea and vomiting.
CHRONIC: None known
TARGET ORGANS: **Acute:** Skin, Respiratory System and Eyes **Chronic:** None known

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients:	WT%	CAS#	EINECS #	GHS Hazard Classification(s)
All ingredients are either nonhazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).				

NOTE: This product has been classified in accordance with the hazard criteria of 29CFR1910.1200 and the SDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

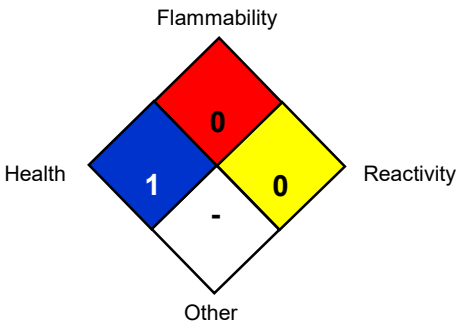
4. FIRST-AID MEASURES

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.
SKIN CONTACT: Wash skin thoroughly with soap and water after handling. Seek medical attention if irritation develops and persists.
INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention.
INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or SDS with the victim to the health professional.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Non-Flammable
AUTOIGNITION TEMPERATURE: Not Available
FLAMMABLE LIMITS (in air by volume, %): Lower NA Upper NA
FIRE EXTINGUISHING MATERIALS: Use fire extinguishing methods below:
Water Spray: Yes Carbon Dioxide: Yes
Foam: Yes Dry Chemical: Yes
Halon: Yes Other: Any "C" Class
UNUSUAL FIRE AND EXPLOSION HAZARDS: Not considered a fire or explosion hazard.
Explosion Sensitivity to Mechanical Impact: No
Explosion Sensitivity to Static Discharge: No
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.

SPILLS: Contain spill if safe to do so. Sweep or vacuum up and place in an appropriate closed container. Clean up residual material by washing area with water and detergent. Dike or retain dilution water or water from firefighting for later disposal. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Use good hygiene practices.

STORAGE AND HANDLING PRACTICES: Store in original container. Keep container closed when not in use. Store in a cool, dry location. Avoid freezing or extended storage in high temperatures and away from incompatible materials.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

PARTICULATES NOT OTHERWISE REGULATED RESPIRABLE FRACTION

	TWA	STEL
OSHA	5 mg/cu m	

PARTICULATES NOT OTHERWISE REGULATED TOTAL DUST

	TWA	STEL
OSHA	15 mg/cu m	

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided above.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Not required when using this product. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses or goggles are recommended to avoid eye contact. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, and the European Standard EN166, Australian Standards, or relevant Japanese Standards.

SKIN PROTECTION: Wear impervious gloves for prolonged or repeated exposure as appropriate to task when using this product. If necessary, refer to U.S. OSHA 29 CFR 1910.138, the European Standard DIN EN 374, the appropriate Standards of Canada, Australian Standards, or relevant Japanese Standards.

BODY PROTECTION: Use body protection appropriate to task being performed. If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE (Physical State) and COLOR: This product is a white and brownish-yellow powder. **ODOR:** Mild, sweet odor
ODOR THRESHOLD: Not Available
pH (in solution at 1.0 g/L): 7.0 - 8.0
MELTING/FREEZING POINT: Not Available
BOILING POINT: Not Available
FLASH POINT: Not Available
EVAPORATION RATE (n-BuAc=1): Not Available
FLAMMABILITY (SOLID, GAS): Not Available
UPPER/LOWER FLAMMABILITY OR EXPLOSION LIMITS: Not Available
VAPOR PRESSURE (mm Hg @ 20°C (68°F)): Not Available
VAPOR DENSITY: Not Available
DENSITY: 1.0-1.2 g/cm^3
SOLUBILITY IN WATER: Soluble in water
PARTITION COEFFICENT (n-octanol/water): Not Available
AUTO-IGNITION TEMPERATURE: Not Available
DECOMPOSITION TEMPERATURE: Not Available
VISCOSITY: Not Available

10. STABILITY and REACTIVITY

STABILITY: Stable under conditions of normal storage and use.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon oxides (monoxide, dioxide), Metal oxide fumes, Sodium oxides.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizing agents, strong bases, strong acids, lime.
POSSIBILITY OF HAZARDOUS REACTIONS: Will not occur.
CONDITIONS TO AVOID: Extreme heat and humidity.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA:
No data available for this product.
SUSPECTED CANCER AGENT: Ingredients within this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, or CAL/OSHA and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.
IRRITANCY OF PRODUCT: No specific data available
SENSITIZATION TO THE PRODUCT: This product is not a skin and respiratory sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
TOXICITY DATA:
No data available for this product.
ENVIRONMENTAL STABILITY: This material will degrade in the environment.
CHEMICAL EFFECT ON PLANTS, ANIMALS AND AQUATIC LIFE: This product is not expected to cause significant harm to plants, animals or aquatic life.
WATER ENDANGERMENT CLASS: Water endangering in accordance with EU Guideline 91/155-EWG – Not Determined.
SPECIFIC AVAILABLE COMPONENT INFORMATION: No additional data available at this time.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.
EU Waste Code: Not determined

14. TRANSPORTATION INFORMATION

US DOT, IATA, IMO, ADR:

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS: This product is classified (per 49 CFR 172.101) by the U.S. Department of Transportation, as follows:

PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: None
UN IDENTIFICATION NUMBER: None
PACKING GROUP: NA
DOT LABEL(S) REQUIRED: None
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER: None
RQ QUANTITY: None
MARINE POLLUTANT: The components of this product are not designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is not considered as dangerous goods.

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is not considered as dangerous goods.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not considered by the United Nations Economic Commission for Europe to be dangerous goods.

15. REGULATORY INFORMATION

UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act as follows: None

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal SDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory or are exempted from listing.

OTHER U.S. FEDERAL REGULATIONS: None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Ingredients within this product are not on the Proposition 65 Lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory, or are exempted from listing.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all of the information required by those regulations.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: Complies with WHMIS 2015.

EUROPEAN ECONOMIC COMMUNITY INFORMATION:
This product does not meet the definition of a hazardous substance or preparation as defined by the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.
See Section 2 for Details

AUSTRALIAN INFORMATION FOR PRODUCT: The components of this product are listed on the International Chemical Inventory list.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

JAPANESE ENCS INVENTORY: The components of this product are on the ENCS Inventory as indicated in the section on International Chemical Inventories, below.

POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW: No component of this product is a listed Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:
Asia-Pac: Listed or Exempt from listing
Australian Inventory of Chemical Substances (AICS): Listed or Exempt from listing
Korean Existing Chemicals List (ECL): Listed or Exempt from listing
Japanese Existing National Inventory of Chemical Substances (ENCS): Listed or Exempt from listing
Philippines Inventory of Chemicals and Chemical Substances (PICCS): Listed or Exempt from listing
Swiss Giftliste List of Toxic Substances: Listed or Exempt from listing
U.S. TSCA: Listed

16. OTHER INFORMATION

ABBREVIATIONS AND ACRONYMS:

EPA: United States Environmental Protection Agency
ARD: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)

PREPARED BY: Chris Eigbrett – (**MSDS to GHS Compliance)**
DATE OF PRINTING: July 19, 2016

The information contained herein is believed to be accurate but is not warranted to be so. Data and calculations are based on information furnished by the manufacturer of the product and manufacturers of the components of the product. Users are advised to confirm in advance of the need that information is current, applicable and suited to the circumstances of use. Remediation and Natural Attenuation Services Inc. assumes no responsibility for injury to vendee or third party person proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Furthermore, Remediation and Natural Attenuation Services Inc. assumes no responsibility for injury caused by abnormal use of this material even if reasonable safety procedures are followed.

END OF SDS SHEET

RNAS REMEDIATION PRODUCTS

Setting Up a Four-Channel System

Here is our 1-Channel system set up, but there are two wells. You could inject sequentially into the two wells and double your field time.

Or you could use our 4-Channel system and inject into as many as 4 wells simultaneously.

The 4-Channel system includes all of the equipment found in a 1-Channel system plus a 1 x 4 manifold and the hoses, flow meters, wellhead units and compression couplings needed for a system total of four wells.

Setting up a 4-Channel system is identical to the procedure for a 1-Channel system from the water supply source and Newman Zone container to the end of the discharge hose. Remove the 1" x 3/4" male/male adapter at the downstream end of the 1" discharge hose.

Install the 1 x 4 manifold with the camlock connectors.

Connect to the other wells in the same manner as with the 1-Channel system.

Valve off the unused ports. The manifold also allows you to valve off a well at any time without interrupting injection into the other wells.

The completed setup for two wells. The Dosmatic® pumps have capacities of 20 to 30 gallons per minute depending on model. So, a single pump can inject 5 to 7.5 gallons per minute into four wells simultaneously.

RNAS REMEDIATION PRODUCTS

Unpacking a 4-Channel Kit

1. Inspect parts for breakage during shipping (left to right): (1) 50' braided hose and (4) 25' braided hoses, (3) wellhead units, (3) mechanical flow meters, (3) 1-1/2" x 2" compression couplings and (3) 1-1/2" x 1" compression couplings, (3) digital flow meters, (3) jumper hoses.

2. Follow the instructions for setting up a 1-channel system. For more complete set-up directions, see our website: http://rnasinc.com/product-resources/four-channel-system/

3. Flush the system daily with fresh water, including the amendment hose and lower unit of the Dosmatic. The vegetable oil in Newman Zone will begin to polymerize when exposed to air. The particles in Neutral Zone will settle out in the Dosmatic and meters. In either case, stoppages and delays are possible without regular flushing and rinsing.

4. Keep the filter in the inlet hose assembly clean and in place; the Dosmatics require clean water.

5. Use only products from RNAS Remediation Products. Some competitors' products or materials containing suspended solids (whey, protein, ZVI, etc.) are KNOWN to create stoppages in both the Dosmatics and the meters.

6. Call us (763.585.6191) if you have questions or concerns.

RNAS REMEDIATION PRODUCTS

Returning a 4-Channel Kit

1. Thoroughly flush the system with clean water and hose down the exterior.

2. Coil all of the hose into the tool box using coils that are as large as the box will accept. Ideally, coil 100' of the 150' in a single stack against the box sides and the remaining 50' inside and against the previously coiled hose; inefficiently coiled hose will result in the remaining parts not fitting in the tool box;

3. Place the manifold and then the three mechanical flow meters on the box bottom;

4. Place the three wellhead units in their bags on top of the mechanical flow meters;

5. Place the three digital flow meters in their bags on top of the wellhead units, insuring that there is a couple of inches of clearance between the meters and the lid when it is closed;

6. Place the six wellhead fitting compression couplings in the corners between the hose and the box, maintaining clearance between digital meters and the top to prevent breakage;

7. Place the three short hose jumpers on top.

8. Use the included zip-ties to secure the tool box lid.

Return via FedEx ground (or equivalent) to:

RNAS Remediation Products
6712 West River Road
Brooklyn Center, MN 55430
763-585-6191

RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

DOVER, DE - DOVER AIR FORCE BASE, AREA 6

SITE OVERVIEW

Since World War II, Dover Air Force Base (DAFB) has been a center for military air-cargo operations in the Eastern US. Degreasing solvents were routinely used in aircraft maintenance and releases were common. Area 6 was the largest contaminated groundwater plume found at DAFB and it measured 6,000 ft. long and covered 300 acres. The plume was located in a shallow surficial aquifer. Primary contaminants of concern were TCE, DCE and VC. Accelerated Anaerobic Bioremediation (AAB) treatment was selected in 2006 for the source areas and core of the dissolved plume.

GOALS AND CHALLENGES

Remediation cannot interfere with DAFB military operations. The existing site infrastructure (buildings, asphalt and concrete) limited access to potential substrate injection locations. Uniform substrate distribution was a challenge as the plume was located in unconsolidated deposits of clay, silt, sand and gravel.

REMEDIATION APPROACH – NEWMAN ZONE EVO

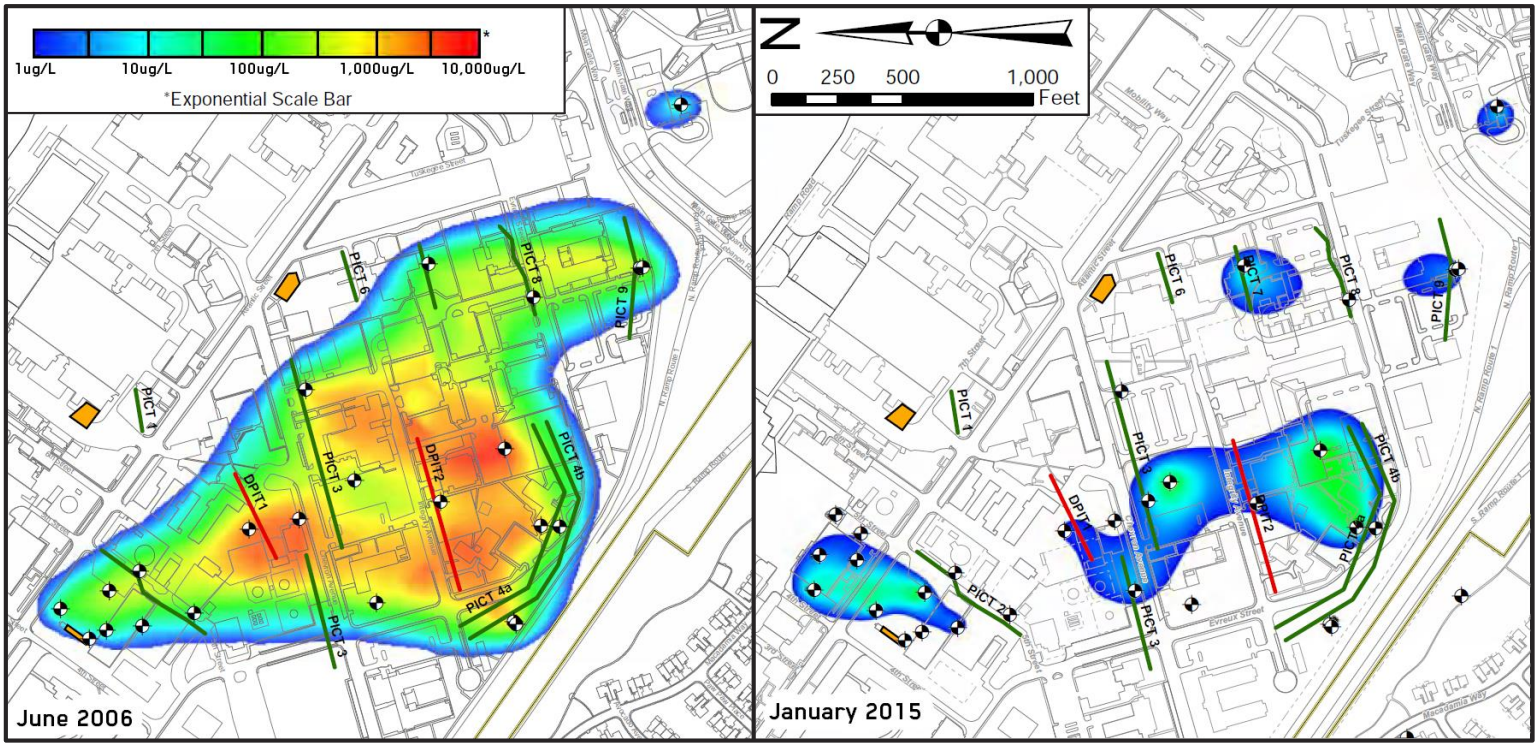
Direct injection of electron donor products was selected for the source areas and for two biobarrier transects (DPITs). To reduce the number of injection points, circulation between permanent wells was used in nine biobarriers (PICTs). Performance issues with other products resulted in the change to Newman Zone® emulsified vegetable oil (EVO) within the PICTs in 2007. Newman Zone EVO provided the best substrate distribution with minimal loss of hydraulic conductivity.

RESULTS

A large reduction of plume area and contaminant mass was achieved. Increases in DCE, vinyl chloride and most importantly Ethene provide strong evidence of complete dechlorination. Most of the dissolved mass is degrading within a short distance downgradient from the source area.

"We use Newman Zone primarily in the permanent injection transects where we pump to circulate the water. The smaller droplet size is more mobile and doesn't clog the wells as much as other products."

TCE Over Time in the Columbia Aquifer (URS, 2015)



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(763) 585.6191 www.RNASinc.com

EMERYVILLE, CA - MIXED INDUSTRIAL SITE

SITE OVERVIEW

This brownfield has a history of industrial use including rail, oil and plastics companies. The site is planned for future commercial, retail and residential development. Soil excavation in 2009 removed the majority of petroleum and metal contamination but significant concentrations of chlorinated solvents remained in the soil and groundwater. Primary contaminants of concern were PCE, TCE and associated daughter products. Soils are primarily silty clays with two coarse grained, high-permeability channels running across the site below the water table.

GOALS AND CHALLENGES

Poor buffering capacity across the western third of the site required pH adjustments and monitoring to maintain favorable dechlorinating conditions. The two high-permeability channels contained a majority of the contaminant mass and required large volumes of amendment to treat. Furthermore, data suggests an upgradient (off site) source area is likely contributing to the dissolved plume on site and elevating contaminant concentrations above water quality standards.

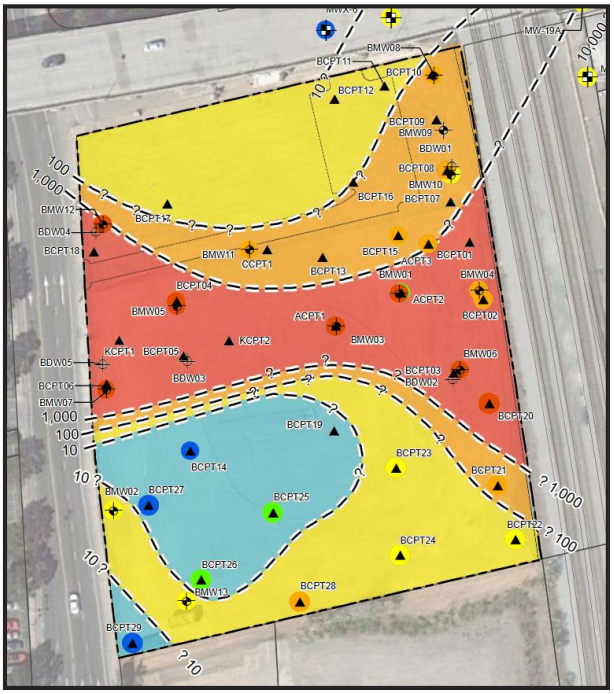
REMEDIATION APPROACH – NEUTRAL ZONE & NEWMAN ZONE EVO

Multiple competitor products were pilot tested on site. RNAS's Neutral Zone buffer and Newman Zone® emulsified vegetable oil (EVO) were determined to be the most effective products pilot tested for bioremediation of CVOCs. In 2013 site wide application of RNAS products was completed using direct push injections. Neutral Zone was necessary to maintain favorable pH and Newman Zone EVO served as an electron donor for the bacterial community. Two phases of injections were conducted, with an increased buffer concentration in the second phase, totaling 163 injection points across the treatment area.

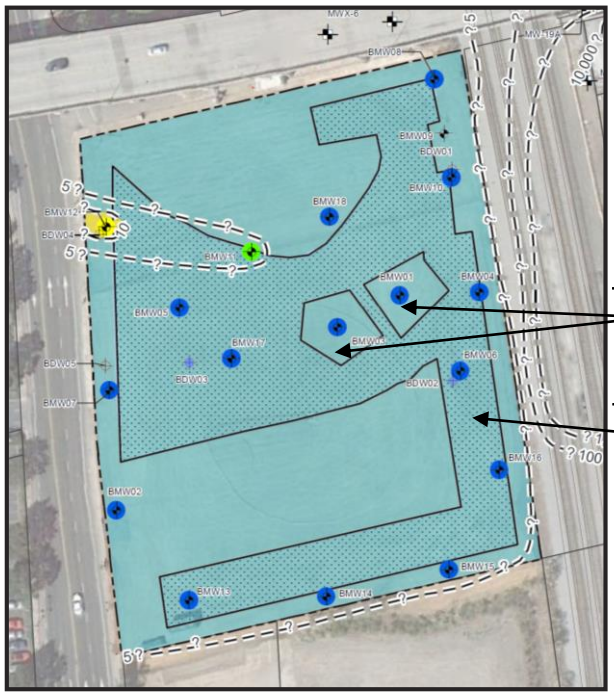
RESULTS

Poorly buffered areas had a pre-treatment pH as low as 5.6 and were expected to decrease as a result of contaminant dechlorination. Neutral Zone buffer raised and maintained the pH in problematic areas at pH 6.2 with a site wide average of pH 6.7. Newman Zone EVO injections decreased total CVOC concentrations by an average of 98% and continue to maintain favorable reducing conditions. Monitoring will continue on site until the potential upgradient source area is addressed.

TCE Distribution, Pre-treatment



TCE Distribution, Post-treatment



Pilot Treatment Areas

Full Scale Treatment Area

TCE: Above 1,000 µg/L | 100 – 1,000 µg/L | 10 – 100 µg/L | Below 10 µg/L

0 75 150 225 feet

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SEAL BEACH, CA - NAVAL WEAPONS STATION

SITE OVERVIEW

The Seal Beach Naval Weapons Station is a US Navy weapons and munitions loading and storage facility located in Seal Beach, California. From 1962 to 1973 NASA and its contractors utilized IRP Site 70 to design and manufacture the second stage of the Saturn V launch vehicle for the Apollo Program. Large quantities of TCE were released resulting in high concentrations of dissolved TCE in the surficial aquifer and suspected DNAPL in the source area.

GOALS AND CHALLENGES

Prior to treatment the plume extended approximately 4,000 feet downgradient of the source area, reached depths of up to 160 feet below ground surface and covered an area of about 75 acres. Active treatment targeted the plume area where TCE concentrations exceeded 250 µg/L. Remediation using a pump-and-treat system was largely ineffective at reducing contaminant mass or the overall extent of the plume. The primary treatment challenge is the large dissolved plume area and volume. A relatively high ground water flow velocity and high sulfate concentrations consumed electron donor and limited the longevity of electron donor injections.

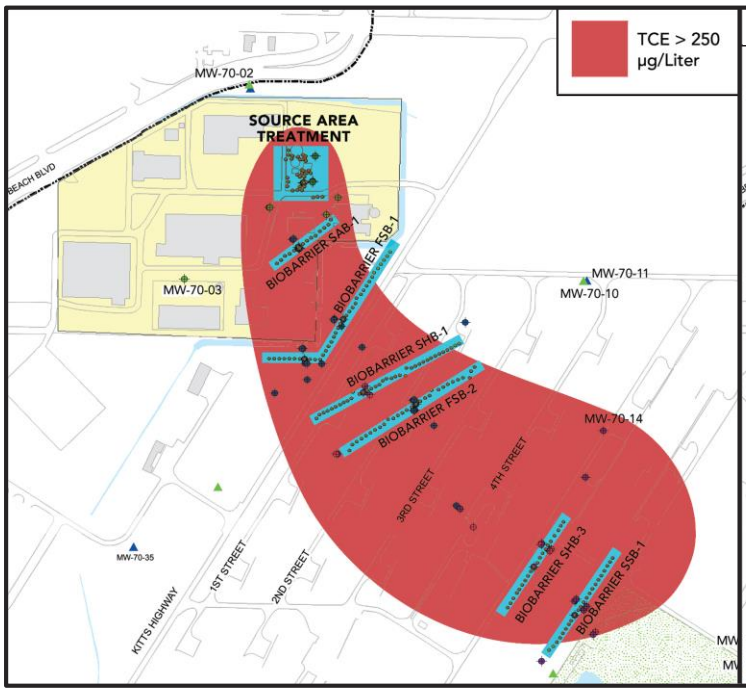
REMEDIATION APPROACH – NEWMAN ZONE EVO

Enhanced In Situ Bioremediation (EISB) was implemented to address the dissolved plume and source area. Newman Zone® emulsified vegetable oil (EVO) was selected for an electron donor because the small uniform oil droplet size allowed for large volume injections and circulation between widely spaced wells. Bioaugmentation using the SiREM KB-1® culture was also used to ensure complete dechlorination of TCE to ethene. Source area injections were completed in 2009 using 56 injection wells. Six biobarriers were used to treat the large dissolved plume using a total of 154 injection wells. The EVO solution was applied to the biobarriers using recirculation between the wells in 2010. Multiple screened intervals at each well location allowed injection over a large vertical interval.

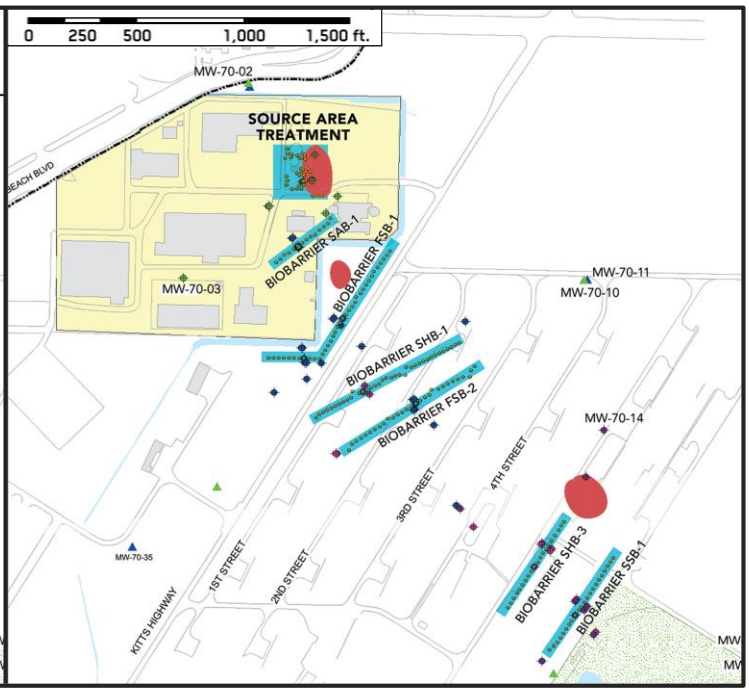
RESULTS

By 2012 the extent of the dissolved TCE plume was dramatically reduced. Significant concentrations of daughter products DCE and VC were still present but strong evidence of complete dechlorination to ethene was observed in all biobarriers and the source area wells. Modeling predicts that maintaining the biobarrier activity for an extended number of years may be needed to reach final treatment goals.

2008 Baseline TCE Extent



2012 TCE Extent



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(763) 585.6191 www.RNASinc.com

NORTHERN CA – CHEMICAL MANUFACTURING FACILITY

SITE OVERVIEW

This currently inactive site has historically supported a mix of industrial and agricultural uses since the 1950s, including the manufacturing of chlorofluorocarbons (CFCs) and anti-knock gasoline additives. The contaminants of concern are PCE and its daughter products in the surficial and upper aquifers, likely released from retention ponds during titanium dioxide manufacturing. Soils are unconsolidated alluvial deposits intermixed with confining layers and lenses, underlain by a 200' thick silty clay deposit.

GOALS AND CHALLENGES

Primary remedial objectives are to protect human and environmental health while controlling and eliminating the extent of contamination. The wide range of historical activities at this 400-acre site have led to a complex distribution of contaminants and the need for long-term remediation objectives.

REMEDIATION APPROACH – NEWMAN ZONE HRO, QR & NEUTRAL ZONE

Due to the complexity of the plume, a multi-strategy approach combining enhanced in-situ bioremediation (EISB), phytoremediation, natural attenuation and land use covenants was chosen. The two targeted treatment areas for EISB cover approximately 6,300 ft^2 to a thickness of 10 ft. Fifteen injection wells were installed with an assumed 10 ft. radius of influence, receiving a total of 37,000 gallons of injection fluid. The substrate mixture contained 4.9% Newman Zone HRO, 0.8% Newman Zone QR and 3.4% Neutral Zone pH buffer in clean groundwater. Newman Zone HRO is a self-emulsifying electron donor that produces 1 to 10-micron oil droplets, providing high retention electron donor in large grained soils or fractured bedrock. Newman Zone QR is a soluble blend of electron donors, nutrients and vitamins that supports the microbial community. Neutral Zone is an insoluble colloidal buffer which provides long term neutralization of the acidity produced by reductive dechlorination.

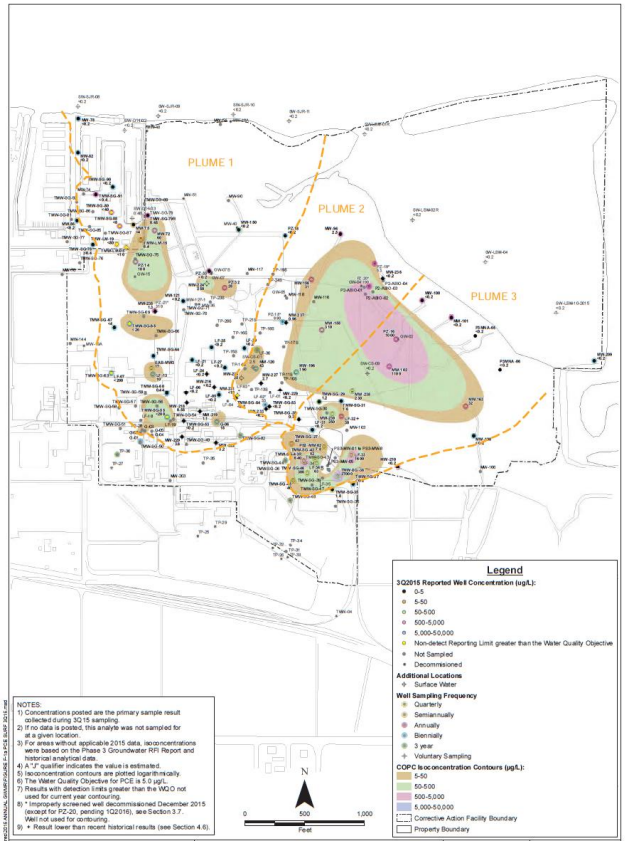
RESULTS

A multiple lines of evidence approach is being used to assess treatment effectiveness. Injections were completed in late 2015 and are expected to maintain dechlorinating conditions for 4 years. Current sampling data was collected only six months after injections but provides a brief window into current trends.

Concentration trends of PCE in the surficial aquifer since baseline range from slightly increasing to a three order of magnitude decrease. Overall, the average concentrations of PCE and its daughter products in the treatment zone have been significantly reduced. PCE concentrations in the upper aquifer are decreasing while PCE daughter products are increasing in concentration, which is common in the first year following injections.

"The fermentation of Newman Zone HRO produces metabolic acids and surfactants that tend to strip contaminant mass out of the soil matrix, substantially increasing contaminant concentration within the first 6 to 9 months. The increased concentrations are expected to tail off over time as EISB continues" (Parsons, 2016).

Baseline PCE Concentrations, 2015



APPENDIX F

Environmental Easement Checklist

ENVIRONMENTAL EASEMENT
CHECKLIST/CERTIFICATION
SITE No. 10798

The following requirements and attachments must be included as part of the submission to the Department for an Environmental Easement. Upon completion of the review, an attorney must sign the checklist indicating that they have fully completed the checklist. The Department will not accept submissions which have not been signed as being accurate and complete by both the Remedial Party and Attorney. Where the property owner is not the Remedial Party, the Department also requires the Owner to sign the checklist.

1) Special Circumstances

The last owner search was completed and the deed transfer is by Quit Claim or other restricted transfer deed ☐Yes ☐No

The property in the Brownfield Cleanup Agreement includes lands under water ☐Yes ☐No

The property has multiple owners ☐Yes ☐No

If you answered "Yes" to any of these items, contact the Department's Environmental Easement contact person for a determination as to whether further title work is necessary.

2) Verification of ownership of the property

☐ Submit documentation (such as a corporate resolution) that the signatory on the easement has authority to sign the Easement
☐ Ownership of the property matches the current deed.
☐ Verification reviewed and included for authority to sign Easement.
☐ Updated copies of legal organizational documents have been reviewed and are included. Examples of the appropriate documentation will include, for:
- corporations: articles of incorporation, organizational agreements, minutes of annual meetings, resolutions, authorities for signature;
- partnerships: a copy of the partnership agreement; verification that necessary parties are participating in the Easement;
- trusts: trust agreement, affidavit of no change in the trust; and
- estates: estate letters, powers of attorney.

3) Verification of Property Subject to Easement

☐ Description of the property for the Easement and DEC Agreement/Order/SAC matches description of property in the deed (Separate submittal must be included to explain to the satisfaction of the Department why there is any discrepancy).
☐ The Tax Map identifier (SBL) matches on all documents.

4) Survey Review

- ☐ Survey includes metes and bounds description.
- ☐ Survey includes a graphic scale.
- ☐ Survey includes Tax Map Section, Block and Lot.
- ☐ Survey includes physical address and is consistent with the DEC Agreement/Order/SAC.
- ☐ The survey must bear the name, address, telephone number, signature and certification of the professional land surveyor who performed the survey, his or her official seal and registration number, the date the survey was completed, the dates of all of the surveyor's revisions.
- ☐ The survey boundaries must be drawn to a convenient scale, with that scale clearly indicated. A graphic scale, shown in feet and meters, must be included.
- ☐ The symbols and abbreviations that are used on the survey must be identified by the use of a legend.
- ☐ Diagrams must be accurately presented.
- ☐ The point of beginning of the legal description must be shown.
- ☐ The legal description must be correct.
- ☐ The legal description must state the acreage.
- ☐ If the deed(s) description differs from the measured bearings/angles/distances, both must be indicated on the survey.
- ☐ The survey must show the location of all buildings/monuments/overlaps/encroachments upon the surveyed property with their locations defined by measurement perpendicular to the nearest perimeter boundaries.
- ☐ The survey must depict the location of visible improvements within five feet of each side of boundary lines.
- ☐ The survey must show ponds, lakes, springs, rivers or a natural water boundary bordering on or running through the surveyed property; the survey must measure the location of the natural water boundary and note on the survey the date of the measurement.
- ☐ The survey must correctly depict the environmental easement area with corresponding metes & bounds description and acreage, and include the following sentence: "*This property is subject to an environmental easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the New York Environmental Conservation Law. The engineering and institutional controls for this Easement are set forth in the Site Management Plan (SMP). A copy of the SMP must be obtained by any party with an interest in the property. The SMP can be obtained from NYS Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at derweb@dec.ny.gov".* This reference must be located on the face of the survey and be in at least 15-point type.
- ☐ If the survey consists of more than one sheet, sheets must be numbered and the total number of sheets must be indicated on each sheet.

☐ In addition to county-specific requirements, submittal of the approved survey to the Department must include the following:

- A "D" sized copy (24" x 36") of the final signed, stamped map
- A 600 DPI scan of the final signed, stamped map
- An Autocad .dwg or exported .dxf file of the polyline (at a minimum) of the final survey

5) Submissions

☐ The Environmental Easement Package being submitted to the Department includes the applicable documents set forth in Attachment A.

PLEASE READ THE FOLLOWING CAREFULLY

The Remedial Party and the Remedial Party's attorney understand and acknowledge that the New York State Department of Environmental Conservation will rely on each and every answer in this statement: (1) to determine whether the Easement Package can be reviewed in a timely fashion; and (2) to determine whether the Easement Package should be approved. The Remedial Party and the Remedial Party's attorney understand and acknowledge that any false statement or misrepresentation herein will constitute cause for the revocation of the Certificate of Completion issued in reliance on this checklist and accompanying documentation. The Remedial Party and the Remedial Party's attorney further acknowledge that the failure to provide the Department with valid and enforceable Environmental Easement on the property may be grounds for the Department to revoke any Certificate of Completion for the site.

Statement of Certification and Signatures

I have reviewed the information being submitted in relation to this Easement Package and this information, to the best of my knowledge and belief, is accurate and correct. I further acknowledge that the failure to provide the Department with valid and enforceable Environmental Easement on the property may be grounds for the Department to revoke any Certificate of Completion for the site.

1) By Remedial Party:
I hereby affirm that information provided on this form and its attachments is true and complete to the best of my knowledge and belief. I further acknowledge that the failure to provide the Department with valid and enforceable Environmental Easement on the property may be grounds for the Department to revoke any Certificate of Completion for the site.

Date: _____ Signature: _____

Print Name:_____

2) By Remedial Party's Attorney:
I hereby affirm that I am the attorney for _____ (entity); that I am authorized by that entity to make this certification; that this certification was prepared by me or under my supervision and direction; and that information provided on this form and its attachments is true and complete to the best of my knowledge and belief.

Date: _____ Signature: _____

Print Name:_____

Attachment

Attachment A

Documents required to be sent in hard copy with electronic formats copied to the Project Manager and Project Attorney for a complete Environmental Easement package:

1) Copy(ies) of current deed(s) and supporting title documentation (see Department Title Requirements).

2) Copy of tax map.

3) Proof of authority to obligate owner of property as set forth in "Verification of ownership of property" on the Easement checklist.

4) Legal description of the easement area, electronic copy to be in an electronic text format (i.e., MS Word or Rich Text Format).

5) One full-sized, signed Survey and an electronic Survey submitted as a fully rendered PDF (not scanned).

6) A draft Notice to Municipality, with appropriate site-specific provisions.

7) Easement Checklist with certification signed by Remedial Party and Remedial Party's attorney.

8) Signed transfer tax forms (TP-584 or ACRIS Forms).

Hard copy submission shall be sent to:

Bradford Burns, Esq.
New York State Department of Environmental Conservation
Office of General Counsel
625 Broadway
Albany, NY 12233-1500

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this _____day of _____, 20__, between Owner(s) Enter property owner(s) name, having an office at Enter property owner's address, County of Dutchess, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of Enter street address of property in the Choose municipality type of Enter property municipality, County of Enter property county and State of New York, known and designated on the tax map of the County Clerk of Enter clerk county as tax map parcel numbers: Section Enter Tax ID Section #. Block Enter Tax ID Block # Lot Enter Tax ID Lot #, being the same as that property conveyed to Grantor by deed dated Enter Deed Date and recorded in the Enter county name or leave blank for NY City deeds County Clerk's Office in Liber and Page Enter Instrument # or Liber and Page #s. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately Enter Acreage +/- acres, and is hereinafter more fully described in the Land Title Survey dated Enter original survey date and, if applicable, "and revised on" and revised survey date prepared by Enter revised surveyor's name or original surveyor's name if not revised, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Choose an Oversight Document TypeNumber: Enter SAC# or BCA/Consent Order Index # and "as amended by Amendment(s) #(s)" as applicable, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Choose the allowable land use if current land use is selected, enter current use.

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Automatic County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Choose the correct list of inapplicable uses., and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation

pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5 the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: Enter DEC Site #
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and

communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

Enter Grantor's Name:

By: _____

Print Name: _____

Title:_____ Date:_____

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF)

On the _____ day of _____, in the year 20 __, before me, the undersigned, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the _____ day of _____, in the year 20__, before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

SCHEDULE “A” PROPERTY DESCRIPTION

Enter Property Description

APPENDIX G

Tax Maps

WAITE STREET

SILVER STREET

ADAMS STREET

BERRY STREET

REXFORD STREET

LEE AVENUE

ERIE LACKAWANNA RAILROAD

Norwich Assembly of God

Chenango County Historical Society

(UNKNOWN OWNER)

See Section 136.33

See Section 136.25

See Section 136.41

See Section 136.26

Part of 136.34-2-19.1

MATCH LINE

MATCH LINE

REAL PROPERTY MAP

© 1998 RPTS

THE USE OF THIS MAP IS FOR REAL PROPERTY TAX ADMINISTRATION PURPOSES ONLY

prepared by Chenango County Tax Map Dept. Norwich, New York

photogrammetry by Air Survey Corporation Reston, Virginia

digital conversion by Weiler Mapping, Inc. Horseheads, New York Feb. 2003

DATE	REVISION

SPECIAL DISTRICTS

TYPE	SYMBOL	CODE	NAME
FIRE	F	FD-15	NORWICH
LIGHT	L		
SCHOOL	SCH	0811-00	NORWICH
SEWER	S		
WATER	W		

LEGEND

STATE OR COUNTY LINE	WATER	AREA	(From Deed)	1.55Ac	INTERSTATE HIGHWAY	86	DATE OF MAP: JUNE, 1973
CITY, TOWN OR VILLAGE LINE	LAND HOOK	AREA	(Calculated)	1.55Ac(c)	U.S. HIGHWAY	20	DATE OF REVISION: MAY, 1975
ROAD OR RAILROAD R/W	SECTION-BLOCK-LOT NUMBER 001-1-100	DIMENSION	(From Deed)	16.50'	NEW YORK STATE HIGHWAY	12	
EASEMENT R/W LINE	COORDINATE LOCATOR NO. (E800,000-N800,000)	DIMENSION	(Scaled)	66.0(s)	COUNTY HIGHWAY	32	
PROPERTY LINE	PATENT OR REALTY LOT NO. 36 or (/)	DIMENSION		66.50(m)	STREET AND TOWN ROAD	BY NAME	

SCALE: 1"=50'

N

INDEX TO ADJOINING MAP SECTIONS

136.24	136.25	136.26
136.32	136.33	136.34
136.40	136.41	136.42

CITY OF NORWICH

CHENANGO COUNTY, NEW YORK

E1106-N926 081100 136.33

REXFORD STREET

GOLD STREET

MITCHELL STREEET

MITCHELL STREET

SILVER STREET

STATE STREET

SOUTH MITCHELL STREET

ERIE LACKAWANNA RAILROAD
PART OF 136.65-6-37

TURNER STREET

MERRIMAN STREET

AVENUE

Chenango County Historical Society

City of Norwich

19.1
4.27 Ac(c)

See Section 136.41
MATCH LINE
MATCH LINE
See Section 136.33

See Section 136.42

See Section 136.49
MATCH LINE
MATCH LINE
See Section 136.41

See Section 136.49
MATCH LINE
MATCH LINE
Part of 136.41-5-11

1 2.09 Ac(c)

2 1.87 Ac(c)

3 1.04 Ac(c)

4 1.864 Ac

5

REAL PROPERTY MAP

THE USE OF THIS MAP IS FOR REAL PROPERTY TAX ADMINISTRATION PURPOSES ONLY

prepared by
Chenango County Tax Map Dept.
Norwich, New York

photogrammetry by
Air Survey Corporation
Reston, Virginia

digital conversion by
Weiler Mapping, Inc.
Horseheads, New York Feb. 2003

DATE	REVISION
Jun/2010	de 16,17,15 to 14
Jun/2009	de 4-8 to 7
Jul/1998	de 4-25.1 to 25
May/1998	redrew 4-30
Jan/1998	sp 4-25
Dec/1996	sp 1-5, de 1-5.2 to 2
Sep/1987	sp 2-13
Jul/1987	de 1-1, 3 to 2
Aug/1981	redrew 2-10 & 30

SPECIAL DISTRICTS

TYPE	SYMBOL	CODE	NAME
FIRE	F	FD-15	NORWICH
LIGHT	L		
SCHOOL	SCH	0811-00	NORWICH
SEWER	S		
WATER	W		

LEGEND

STATE OR COUNTY LINE	WATER	AREA (From Deed)	1.55Ac	INTERSTATE HIGHWAY	88
CITY, TOWN OR VILLAGE LINE	LAND HOOK	AREA (Calculated)	1.55Ac(c)	U.S. HIGHWAY	20
ROAD OR RAILROAD R/W	SECTION-BLOCK-LOT NUMBER 001-1-100	DIMENSION (From Deed)	16.50'	NEW YORK STATE HIGHWAY	12
EASEMENT R/W LINE	COORDINATE LOCATOR NO. (E800,000-N800,000)	DIMENSION (Scaled)	66.0(s)	COUNTY HIGHWAY	32
PROPERTY LINE	PATENT OR REALTY LOT NO. 36 or (/)	DIMENSION	66.50(m)	STREET AND TOWN ROAD	BY NAME

DATE OF MAP: JULY, 1973 –
DATE OF REVISION: MAY, 1976 –

SCALE: 1"=50'

N

INDEX TO ADJOINING MAP SECTIONS

136.32	136.33	136.34
136.40	136.41	136.42
136.48	136.49	136.50

CITY OF NORWICH
CHENANGO COUNTY, NEW YORK

E1106-N925 081100 136.41

APPENDIX H

Cost Estimates

Table 8-1: Initial Proposed Remedy Cost Estimates

Media to Addressed	Proposed Remedy	Initial Estimated Cost	Duration Assumptions
SITE			
Soil	Soil Removal of Readily Accessible Areas	$ 181,950.00	1x
Perched Zone Groundwater	In-Situ Injection of Reagents	$ 201,300.00	1x
	Groundwater Monitoring Program	$ 103,990.00	5 year effectiveness evaluation
All Media	Environmental Easement	$ 30,800.00	1x
STUDY AREA			
Unconfined Groundwater	Groundwater Monitoring Program	$ 174,975.00	5 year monitoring program
Soil Vapor	Heating Season Monitoring Program	$ 384,225.00	5 year monitoring program
	Vapor Mitigation Systems	$ -	As needed
	Inpsection and Maintenance	$ -	As needed
REPORTING			
	Quarterly Progress Reports	$ 47,000.00	Through ROD
	Final Engineering Report	Included above	1x
	Site Management Plans	Included above	1x
	Annual Report	Included above	5 year monitoring program
OTHER			
	Project Management	$ 73,668.00	
	Agency Oversight	$ 34,650.00	
	Legal Servces	$ 34,940.00	
TOTAL		**$ 1,267,498.00**	

APPENDIX I

Electronic Submission (CD)