PROPOSED REMEDIAL ACTION PLAN

Barthelmes Manufacturing Site
State Superfund Project
Rochester, Monroe County
Site No. 828122
February 2013

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

PROPOSED REMEDIAL ACTION PLAN

Barthelmes Manufacturing Site
Rochester, Monroe County
Site No. 828122
February 2013

SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), is proposing 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 proposed by this Proposed Remedial Action Plan (PRAP). The disposal of hazardous wastes at this site, as more fully described in Section 6 of this document, has contaminated various environmental media. The proposed remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for the preferred 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 Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York; (6 NYCRR) Part 375. This document is a summary of the information that can be found in the site-related reports and documents in the document repository identified below.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all PRAPs. This is an opportunity for public participation in the remedy selection process. The public is encouraged to review the reports and documents, which are available at the following repository:

Lyell Branch Library
Attn: Erin Clarke
956 Lyell Avenue
Rochester, NY 14606
Phone: (518) 428-8234

A public comment period has been set from:

2/27/2013 to 3/28/2013

A public meeting is scheduled for the following date:

3/13/2013 at 7:00 PM

Public meeting location:

Gates Public Library

At the meeting, the findings of the remedial investigation (RI) and the feasibility study (FS) will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP.

Written comments may also be sent through 3/28/2013 to:

Jason Pelton
NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233
jmpelton@gw.dec.state.ny.us

The Department may modify the proposed remedy or select another of the alternatives presented in this PRAP based on new information or public comments. Therefore, the public is encouraged to review and comment on the proposed remedy identified herein. Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the Department's final selection of the remedy for this site.

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 Barthelmes Manufacturing Site consists of three tax parcels totaling approximately 9.2 acres at 15 Cairn Street, Rochester, NY. The largest parcel is approximately 6.97 acres and contains the manufacturing building. The other two parcels total approximately 2.2 acres and contain the entry road and facility parking lot. The site is located approximately one half mile northeast of the intersection of Cairn Street and Chili Avenue and less than 1,000 feet east of the NYS Barge Canal. The site is located in a mixed industrial and commercial area and is bordered immediately to the west by the New York Central Railroad. A vacant lot that was formerly part of a major oil storage facility borders the site to the south. A combination of industrial and commercial land uses border the site to the north and east.

Site Features: A single, approximate 50,000 square foot, one story building is the only structure located on the 15 Cairn Street property. The site building, a paved parking lot and loading dock, and two paved roads entering the site from Cairn Street, occupy the majority of the central portion of the site. The remainder of the site east and west of the building is covered with a grassy surface.

Current Zoning/Uses: The two smaller parcels (1 acre and 1.22 acres) are zoned commercial and the larger (6.97 acre) parcel is zoned industrial. The manufacturing building is located on the larger, industrially zoned parcel. The northern portion of the building is used for manufacturing of sheet metal products. A loading dock and storage yard are located along the southern half of the site building. The nearest residential area is 0.2 miles east of the site.

Past Use of the Site: The property has been used for commercial and industrial purposes since at least 1900. Barthelmes Manufacturing Company, a metal finishing facility, has occupied the site since 1921. Prior uses that appear to have led to site contamination include aluminum and sheet metal manufacturing, machining, metal plating, degreasing, use of a drum storage area, and discharge of wastewater from a series of floor drains to an on-site stormwater drainage basin. A fire at the site building in 1980 engulfed the southern portion of the building and may have also contributed to the release of chlorinated solvents from the area of a former vapor degreaser.

Following a site investigation completed by Barthelmes Manufacturing in October 2001, the site entered into the NYSDEC Brownfield Cleanup Program in 2004. The Brownfield Cleanup Agreement was terminated in October 2009 due to the failure by Barthelmes Manufacturing to fully comply with the Agreement.

Site Geology and Hydrogeology: Site geology consists of fine to coarse sand with trace amounts of gravel. The overburden is approximately 16 to 20 feet thick and is underlain by the Lockport Dolomite. Groundwater occurs at a depth of approximately 8 to 22 feet beneath the ground surface. In general, groundwater flow in both overburden and shallow bedrock is to the south.

A site location map is attached as Figure 1.

SECTION 4: <u>LAND USE AND PHYSICAL SETTING</u>

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 commercial use (which allows for industrial use) as described in Part 375-1.8(g) are/is being evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the investigation 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:

Cairn Street I, LLC

CIRA Realty, Inc.

K. Barthelmes Manufacturing Company, Inc.

Marilyn Wischmeyer

Eric J. Wischmeyer

Anne C. Wischmeyer

Janet M. Wischmeyer

Thomas C. Wischmeyer

Phillip B. Dattilo

Linda Dattilo

Lori E. Neumann

Daniel Neumann

The PRPs for the site declined to implement a remedial program when requested by the Department. After the remedy is selected, the PRPs will again be contacted to assume responsibility for the remedial program. If an agreement cannot be reached with the PRPs, the Department will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the state for recovery of all response costs the state has incurred.

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,
- 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 contaminant(s) of concern identified at this site is/are:

TRICHLOROETHENE (TCE)	TETRACHLOROETHYLENE (PCE)
COPPER	ACETONE
CHROMIUM	ARSENIC
DICHLOROETHYLENE	ZINC
VINYL CHLORIDE	LEAD

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

- groundwater
- soil
- soil vapor intrusion
- indoor air

6.2: <u>Interim Remedial Measures</u>

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(s) has/have been completed at this site based on conditions observed during the RI.

<u>IRM - Former Drum Storage Area Soil Excavation</u>

A former drum storage area is located adjacent to the southeast corner of the site building. Chlorinated volatile organic compounds (CVOCs), including TCE and TCE breakdown products, are the primary site contaminants detected in the former drum storage area. The IRM included excavation of soil above the protection of groundwater soil cleanup objectives (SCOs). The TCE contaminated soil located in this area represented a source for groundwater contamination at the Barthelmes Manufacturing Site. Groundwater beneath the former drum storage area contained TCE at concentrations up to 10,000 parts per billion (ppb) and above the groundwater standard of 5 ppb for TCE.

In January 2012, a total of approximately 1,143 tons of TCE contaminated soil was removed and disposed of off-site at a permitted facility. Following excavation, a demarcation barrier was placed in the excavation to delineate soil left in place from the material used as backfill. Clean fill meeting the requirements of DER-10, Appendix 5 was brought in to complete the backfilling of the excavation. Post excavation soil sampling documented that the IRM was effective in removing soil containing TCE at concentrations that exceeded the protection of groundwater SCO (0.470 ppm). Prior to backfilling, a horizontal injection well was installed in the excavation area for later use with in-situ applications to address residual groundwater contamination.

IRM - Former Vapor Degreaser Area Soil Excavation

A vapor degreaser was historically operated in the central portion of the site building. CVOCs, including TCE and TCE breakdown products, are the primary site contaminants detected in the former drum storage area, but three metals (arsenic, copper, and zinc) were also detected in soil from this area at concentrations exceeding the industrial use SCOs. The IRM included excavation of soil containing CVOCs at concentrations exceeding the protection of groundwater SCOs and metals exceeding commercial restricted use SCOs. The CVOC contaminated soil located in this area represented a source for groundwater contamination at the Barthelmes Manufacturing Site. Groundwater near the former vapor degreaser area contained TCE at concentrations up to 4,400 ppb and above the groundwater standard of 5 ppb for TCE.

Between January 16, 2013 and February 8, 2013, a total of approximately 110 tons of CVOC and metals contaminated soil was removed and disposed of off-site at a permitted facility. Following excavation, a demarcation barrier was placed in the excavation to delineate soil left in place from the material used as backfill. Clean fill meeting the requirements of DER-10, Appendix 5 was brought in to complete the backfilling of the excavation.

With the exception of inaccessible soil left beneath a building structural support footing, post excavation soil sampling documented that the IRM was effective in removing soil containing CVOCs at concentrations exceeding the protection of groundwater SCOs. Confirmation soil samples collected from beneath a concrete footing contained cis-1,2-DCE at a concentration (0.570 ppm) slightly above the protection of groundwater SCO (0.250 ppm). The cis-1,2-DCE present in soil that could not be removed during the IRM represents a small volume of soil and only marginally exceeds the protection of groundwater SCO for cis-1,2-DCE. TCE and cis-1,2-DCE achieved the protection of groundwater SCOs in all of the remaining post excavation confirmation soil samples. Similarly, arsenic, copper, and zinc were not detected in post-excavation soil samples at concentrations exceeding the respective commercial use SCOs.

Prior to backfilling, a horizontal injection well was installed in the excavation area for later use with in-situ applications to address residual groundwater contamination.

IRM - Outside Disposal Area Soil Excavation

An outside disposal area was identified near the southwest corner of the site building. CVOCs, including TCE and TCE breakdown products, are the primary site contaminants detected in soil from the outside disposal area. The IRM included excavation of soil exceeding the protection of groundwater SCOs. The TCE contaminated soil located in this area represented a source for groundwater contamination at the site. Groundwater near the outside disposal area contained TCE at concentrations ranging from 1,200 to 1,800 ppb and exceeding the groundwater standard of 5 ppb for TCE.

Between January 2012 and September 2012 during two separate soil excavation events, a total of approximately 1,328 tons of TCE contaminated soil was removed and disposed of off-site at a permitted facility. Following excavation, a demarcation barrier was placed in the excavation to delineate soil left in place from the material used as backfill. Clean fill meeting the requirements of DER-10, Appendix 5 was brought in to complete the backfilling of the excavation. Post excavation soil sampling documented that the IRM was effective in removing soil containing TCE and TCE breakdown products at concentrations exceeding the protection of groundwater SCOs. Prior to backfilling, a horizontal injection well was installed in the excavation area for later use with in-situ applications to address residual groundwater contamination.

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.

The Fish and Wildlife Resources Impact Analysis (FWRIA) for OU 01, which is included in the RI report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

Nature and Extent of Contamination:
Four separate investigations have been completed to characterize the nature and extent of contamination associated with former industrial operations at the Barthelmes Manufacturing site. Three of the investigations were completed by Barthelmes Manufacturing under the Brownfield Cleanup Program between 2001 and 2007 and a Remedial Investigation (RI) was completed by the New York State Department of Environmental Conservation (Department) in January 2013. The investigations identified chlorinated volatile organic compounds (CVOCs), including trichloroethene (TCE) and TCE breakdown products (cis-1,2-DCE and vinyl chloride) along with metals, as the primary contaminants of concern. The site contaminants were identified in a former vapor degreaser area, former drum storage area, an outside disposal area, and a storm water drainage basin at concentrations exceeding the standards, criteria, and guidance (SCGs). The investigation data suggests that the historic release or disposal of the chlorinated solvent TCE occurred in the former vapor degreaser area, former drum storage area, and an outside disposal area. Discharge of wastewater from a series of floor drains and storm water runoff to an on-site storm water basin has resulted in soil contaminated with metals in the storm water basin.

The high concentrations of site contaminants in the former vapor degreaser area, former drum storage area, and the outside disposal area were addressed by a series of interim remedial measures (IRMs) between January 2012 and February 2013. The cleanup goals for TCE and TCE breakdown products were the protection of groundwater soil cleanup objective (SCOs).

Soil:
With the exception of one soil sample collected from beneath a building support footing, no CVOCs were detected in site soil at concentrations exceeding the protection of groundwater SCOs. The soil sample collected from beneath the footing contained cis-1,2-DCE at a concentration (0.570 ppm) slightly above the protection of groundwater SCO (0.250 ppm). This residual soil contamination is inaccessible beneath the building foundation and represents only a small volume of soil. Overall, soil sampling at the site documents that the IRMs were effective in removing soil containing CVOCs at concentrations exceeding the protection of groundwater

SCOs. No other CVOCs were detected in site soil at concentrations exceeding the protection of groundwater SCOs.

Metals, including barium, cadmium, chromium, copper, lead, zinc, and mercury were detected in soil collected from the storm water infiltration basin at concentrations exceeding the unrestricted SCOs, but less than the industrial use SCOs. Chromium and barium were the only metals detected in soil at concentrations above the commercial use SCOs of 1,500 ppm and 400 ppm respectively. Specifically, chromium and barium were each detected in three soil samples at concentrations up to 5,830 ppm and 805 ppm respectively. Chromium and barium were detected in a localized area near an outfall located along the northeast corner of the basin. The storm water basin does not contain a surface water inlet or outlet, only periodically contains surface water, and is approximately 0.2 acres in size.

Groundwater:
TCE and its associated degradation products are also found in groundwater beneath the central and south side of the site at concentrations exceeding groundwater SCGs (typically 5 ppb). Specifically, TCE was detected in site groundwater at concentrations up to 10,000 ppb and cis-1,2-DCE, a TCE breakdown product, at concentrations up to 2,300 ppb. Groundwater flow directions and the overall distribution of contaminants suggest that the TCE contamination originated from the former vapor degreaser, former drum storage, and the outside disposal areas. Although the IRM activities completed in these areas removed soil contamination, post-IRM groundwater sampling shows that residual groundwater contamination remains at the site at concentrations above the SCGs. The presence of cis-1,2-DCE, and to a lesser degree vinyl chloride, in site groundwater does suggest that TCE is being degraded naturally at the site. Based on the presence of TCE in groundwater along the south-side of the property at concentrations up to 1,700 ppb, it is expected that some CVOC contamination is migrating with groundwater off-site to the south.

Soil Vapor:
Soil vapor intrusion sampling was completed at the site building by Barthelmes Manufacturing in 2007 under the Brownfield Cleanup Program. Based on this soil vapor intrusion sampling, mitigation was recommended at the one on-site building due to the presence of site contaminants in subslab soil vapor and indoor air samples. Specifically, TCE and cis-1,2-DCE were detected in subslab soil vapor at concentrations up to 64,000 micrograms per cubic meter (ug/m3) and 3,700 ug/m3 respectively. TCE was also detected in indoor air at concentrations ranging from 7 ug/m3 to 33 ug/m3 and indicate that actions are needed to address exposure via soil vapor intrusion. Based on the size of the site parcel, the surrounding industrial land uses, and the lack of nearby structures, off-site soil vapor intrusion was not completed during the RI or during earlier site investigations.

6.4: <u>Summary of Human Exposure Pathways</u>

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 likely to come into contact with contaminated on-site soils because buildings and pavement cover the site. Public water serves the area; therefore, people are not drinking the contaminated groundwater. Inhalation of VOCs from contaminated groundwater could occur via soil vapor intrusion into the indoor air of the on-site building and overlying structures off-site. NYSDOH and NYSDEC will conduct additional investigations to determine the potential for soil vapor intrusion into structures near the site.

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.
- Prevent the discharge of contaminants to surface water.
- 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.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

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 PROPOSED 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 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 proposed remedy is set forth at Exhibit D.

The proposed remedy is referred to as the In-Situ Bioremediation for Groundwater Combined with Targeted Soil Removal remedy.

The estimated present worth cost to implement the remedy is $406,000. The cost to construct the remedy is estimated to be $308,000 and the estimated average annual cost is $6,400.

With the completion of interim remedial measures (IRMs) to address soil contamination at the site, this alternative relies on in-situ groundwater treatment and targeted soil removal combined with site-wide institutional and engineering controls (IC/EC) to address the remaining contamination. Specifically, this remedy builds on the interim remedial actions that have already been taken to remove CVOC contaminated soil exceeding the protection of groundwater SCOs from the site.

The elements of the proposed remedy, shown on Figure 4, are as follows:

1) 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) In-situ bioremediation will be implemented to treat residual groundwater contamination. Biological amendment will be introduced into the subsurface using the injection wells that were installed during the Interim Remedial Measures. The biological amendment will facilitate the continued breakdown of contaminants in these three areas where CVOCs remain at concentration above the SCGs in site groundwater. The biological breakdown of contaminants would be enhanced through anaerobic reductive dechlorination by injecting Hydrogen Release Compound (HRC®), or a similar product, into the subsurface to promote microbe growth. The existing injection wells were constructed with 20 feet of six-inch diameter horizontal screen installed at a depth of approximately ten feet below ground surface. The volume of biological amendment and the need for augmenting the microorganism community to address the residual groundwater contamination will be determined during the remedial design.

Prior to the full implementation of this technology, laboratory and on-site pilot scale studies will be conducted as needed to more clearly define design parameters. It is estimated that the biological amendments will be injected during a minimum of two separate events over a period of at least several months.

3) The site building currently serves as a site cover. This site cover will be maintained to allow for commercial use of the site. Any site redevelopment will maintain a site cover, which may consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper one foot of exposed surface soil will exceed the applicable SCOs. Where a soil cover is required it will be a minimum of one foot of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for commercial use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d).

4) Floor drains located within the Barthelmes Manufacturing building that discharge to the on-site stormwater drainage basin will be closed to prevent continued discharge of manufacturing wastes to the on-site surface water basin.

5) Approximately 75 cubic yards (approximately 110 tons) of soil will be removed from the storm water infiltration basin at the location of the industrial discharge point and transported off-site for disposal. Clean fill meeting the requirements of DER-10, Appendix 5 will be brought in to replace the excavated soil and establish the designed grades at the site.

6) Imposition of an institutional control in the form of an environmental easement for the controlled property that:

• requires 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);
• allows the use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
• restricts 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;
• requires compliance with the Department approved Site Management Plan.

7) 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 Paragraph 6 above.

Engineering Controls: Engineering controls resulting from the soil vapor intrusion evaluation included in the Site Management Plan below.

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 groundwater and/or surface water use restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision 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/or 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 of on-site and off-site groundwater and on-site surface water to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department;
- monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required by the Institutional and Engineering Control Plan discussed in item 7a above.

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, 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 four categories; volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/ polychlorinated biphenyls (PCBs), and inorganics (metals and cyanide). 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 6.1.1 are also presented.

Waste/Source Areas

As described in the RI report, waste/source materials were identified at the site and have impacted groundwater, soil, and soil vapor.

Wastes are defined in 6 NYCRR Part 375-1.2 (aw) and include solid, industrial and/or hazardous wastes. Source Areas are defined in 6 NYCRR Part 375 (au). Source areas are areas of concern at a site where substantial quantities of contaminants are found which can migrate and release significant levels of contaminants to another environmental medium.

Source areas identified at the Barthelmes Manufacturing site include the three areas described below. Soil contamination was removed in each of these source/disposal areas as part of interim remedial measures (see Section 6.2) and are shown on Figure 3.

1) Former Drum Storage Area (OU-01A)
2) Former Vapor Degreaser Area (OU-01B)
3) Outside Disposal Area (OU-01C)

Prior to remediation, trichloroethene (TCE) was detected in soil from the former vapor degreaser area, the outside disposal area, and former drum storage area at maximum concentrations of 4,100 ppm, 490 ppm, 32 ppm respectively and significantly above the Protection of Groundwater Soil Cleanup Objective (SCO) of 0.470 ppm. Remediation activities completed as IRMs (see Section 6.2) in these three source areas removed approximately 2,580 tons of TCE contaminated soil. Post excavation confirmation soil sampling documented that each of the IRMs was effective in removing soil with high concentrations of TCE from these source areas. Specifically, following soil excavation from the former drum storage area, TCE confirmation soil sample results were all less than 0.410 ppm. Following excavation of TCE contaminated soil from the outside disposal area and the former vapor degreaser area, TCE confirmation results were all less than concentrations of 0.330 and 0.470 ppm respectively. In the former vapor degreaser area, a small volume of inaccessible soil containing cis-1,2-dichloroethene (cis-1,2-DCE), a TCE breakdown product, at a concentration (0.570 ppm) slightly above the Protection of Groundwater SCO of 0.250 ppm was left in-place. All other soil sampling results were less than the 0.470 ppm soil cleanup objective.

Although contaminant source material was removed in each of the areas identified above, remnant CVOC groundwater contamination persists at concentrations that exceed the groundwater SCGs in each of these areas. The details of groundwater contamination remaining at the site are discussed below and will be addressed as part of the final site remedy.

The waste/source areas identified at the site were addressed by the IRM(s) described in Section 6.2.

Groundwater

As summarized in Table 1, a total of 62 groundwater samples were collected during four separate sampling events. The groundwater samples were collected from a network of monitoring wells installed as part of the RI along with existing monitoring wells that were installed during earlier site investigations. Groundwater samples were collected during the following sampling events:

1) 14 monitoring wells during a July 2011sampling event;
2) 22 wells during an October 2011 sampling event;
3) 4 wells during a December 2011 event; and
4) 22 wells during a September 2012 sampling event.

During the RI, samples were collected to assess groundwater conditions from monitoring wells constructed with screened intervals within the overburden (less than approximately 20 feet below ground surface) and the shallow fractured bedrock (approximately less than approximately 30 feet below ground surface). Figure 2 illustrates the groundwater sampling results for the October 2011 sampling event and shows the approximate limits of the overburden groundwater contamination.

As shown on Figure 2, the overall distribution of contaminants in groundwater is consistent with groundwater flow patterns and the three areas where disposal has occurred (former vapor degreaser area, the outside disposal area, and former drum storage area). The highest concentrations of site contaminants were detected in overburden groundwater samples collected from beneath the central part of the site building and along the south-central side of the site building. TCE was the site contaminant detected at the highest concentration in groundwater. Specifically, TCE was detected in groundwater samples collected from monitoring well MW-5 at concentrations of 8,500 parts per billion (ppb) to 10,000 ppb and above the groundwater SCG of 5 ppb. Monitoring well MW-5 was located within the former drum storage area but was removed during the January 2012 IRM (Section 6.2 Interim Remedial Measures). TCE breakdown products, including cis-1,2-DCE and vinyl chloride were also detected in site groundwater at concentrations exceeding SCGs. During the July 2011 sampling event, cis-1,2-DCE was detected in groundwater collected from monitoring well MW-1 at a concentration of 6,300 ppb and above the SCG of 5 ppb. Overall, the highest concentrations of TCE breakdown products were consistently detected in groundwater samples collected in the area of the former vapor degreaser located in the central part of the site building (Figure 2). The presence and concentrations of the TCE breakdown products does suggest that degradation of TCE is occurring in groundwater at the site under existing conditions.

Outside of the three disposal areas, TCE concentrations in overburden groundwater decrease significantly to the north, west, and east. TCE is either not detected or detected below the SCGs in overburden groundwater collected west and north of the site building and slightly above the SCGs in overburden groundwater collected from the east-side of the site building. Groundwater samples collected from monitoring wells MW-13 and MW-14, located adjacent to the east side of the site building contained TCE at maximum concentrations of 14 and 19 ppb respectively, slightly above the groundwater SCG of 5 ppb.

Similar to the distribution of site contaminants in overburden groundwater, the highest concentrations of site contaminants in shallow bedrock groundwater occurred beneath the three areas where disposal occurred. Site contaminants are present in shallow bedrock at concentrations exceeding SCGs, but overall, the shallow bedrock groundwater concentrations are lower than the overlying overburden groundwater concentrations. The highest TCE concentration (3,200 ppb) was detected in a former production well (PW-S on Figure 2) located partially downgradient of the former vapor degreaser area. The next highest TCE concentration (1,200 ppb) in shallow bedrock groundwater was detected in a sample collected from monitoring well HRP-BR-3. As shown on Figure 2, HRP-BR-3 is located immediately south of the outside disposal area and adjacent to the south property line. TCE concentrations in the remaining shallow bedrock groundwater monitoring wells were consistently below 1 ppm.

In addition to VOC analysis, on-site groundwater was sampled and analyzed for SVOCs, PCBs, pesticides and inorganics/metals. Based on these analyses, no PCBs, SVOCs or pesticides were detected in site groundwater. Six metals, including arsenic, barium, cadmium, chromium, lead, and nickel were detected in site groundwater at concentrations that marginally exceed the groundwater SCGs. The low concentrations of metals were detected in wells upgradient, downgradient, and beneath the site building. The distribution of metals in site groundwater and overall concentrations suggest that the metals are not necessarily related to disposal at the site but instead are associated with long-term industrial usage of this urbanized area.

Table 1 - Groundwater

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
1,1,2-Trichloroethane	ND – 2.6	1	3 of 62
1,1,2-Trichlorotrifluoroethane (Freon 113)	ND – 39	5	16 of 62
1,1-Dichloroethane	ND – 10	5	4 of 62
1,1-Dichloroethylene	ND – 23	5	2 of 62
Acetone	ND – 1,100	50	2 of 62
Benzene	ND – 1.1	1	1 of 62
Chloroform	ND – 19	7	2 of 62
cis-1,2-Dichloroethylene	ND – 6,300	5	45 of 62
Dichlorodifluoromethane	ND – 7	5	1 of 62
Tetrachloroethylene	ND – 62	5	20 of 62
Trans-1,2-Dichloroethylene	ND – 22	5	4 of 62
Trichloroethene	ND – 10,000	5	49 of 62
Vinyl chloride	ND – 2,400	2	26 of 62
Inorganics			
Arsenic	ND – 0.09	0.025	3 of 37

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
Barium	0.14 – 1.2	1	1 of 37
Cadmium	ND – 0.011	0.005	2 of 37
Chromium, Total	ND – 0.18	0.05	5 of 37
Lead	ND – 0.16	0.025	4 of 37
Nickel	ND – 0.11	0.1	1 of 15

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).

The primary groundwater contaminants are TCE and TCE breakdown products associated with past industrial operations at the site. As noted on Figure 2, the primary groundwater contamination is associated with the former vapor degreaser area, the outside disposal area, and former drum storage area.

The inorganic compounds found in overburden groundwater only marginally exceeded the groundwater SCGs and were detected in an area where disposal was not known to have occurred. The metal compounds found in groundwater are not considered site specific contaminants of concern and will not be addressed as part of the selected remedy.

Based on the findings of the RI, the past disposal of hazardous waste has resulted in the contamination of groundwater. 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 and TCE breakdown products.

Soil

During the RI, a total of 91 surface and subsurface soil samples were collected to depths up to 27 feet below ground surface to delineate the overall extent of soil contamination and to assess soil contaminant impacts to groundwater. A combination of shallow soil borings and test pits were used to collect the subsurface soil samples during the RI. The sampling locations were selected based on a combination of past property uses and the results of earlier site investigations. The results are summarized in Table 2 below and indicate that following completion of IRMs (Section 6.2), CVOC concentrations in soil, with the exception of one sample, ranged from non-detect to 0.470 ppm and no longer exceeded the protection of groundwater (PGW) SCOs for volatile organic compounds. Cis-1,2-DCE was detected at a concentration (0.570 ppm) slightly above the protection of groundwater SCO (0.250 ppm) in a single soil sample collected from beneath a building concrete footing. The cis-1,2-DCE was detected in soil that could not be removed during the IRM and represents a small volume of soil. The PGW SCOs are used for the primary site contaminants that are present in groundwater at concentrations exceeding the groundwater SCGs. The IRM completed in the former vapor degreaser area also removed soil containing metals (arsenic, copper, and zinc) at concentrations exceeding the SCOs for commercial use.

As shown in Table 2, three metals (copper, chromium, and zinc) were detected in site soil at concentrations exceeding the Unrestricted SCOs, but less than the Restricted Use SCO for Commercial Use. Zinc, detected at a concentration of 301 ppm in a soil sample collected from the two to four foot depth interval in the former drum storage area was the metal detected at the highest concentration in site soil. This area within the former drum storage area contained a lot of fill material and scrap metal on the ground surface.

In addition to the collection of subsurface soil samples, a total of six (6) surface soil samples (0 – 6 inches) were collected during the RI and submitted to the laboratory for metals/inorganics, SVOC, pesticide, and PCB analysis. With the exception of dieldrin, detected at a concentration of 0.018 ppm and above the unrestricted SCO of 0.005 ppm, no other pesticides, metals, SVOCs, or PCBs were detected in surface soil samples at concentrations exceeding the unrestricted SCOs. Dieldrin was detected in a surface soil sample collected from a grassy area west of the site building and is not expected to be associated with disposal at the site.

No other pesticides, and no SVOCs or PCBs were detected in site surface and subsurface soil samples at concentrations exceeding the unrestricted use soil cleanup objectives.

Table 2 - Surface and Subsurface Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Use SCG (ppm)	Frequency Exceeding Restricted SCG
VOCs					
1,1-Dichloroethylene	ND – 0.0019	0.330[c]	0 of 91	500[d]	0 of 91
cis-1,2-Dichloroethylene	ND – 0.570	0.250[c]	1 of 91	500[d]	0 of 91
Tetrachloroethylene	ND – 0.044	1.3[c]	0 of 91	150[d]	0 of 91
Trichloroethene	ND – 0.330	0.470[c]	0 of 91	200[d]	0 of 91
Inorganics					
Arsenic	0.46 – 5.1	13	0 of 29	16[d]	0 of 29
Cadmium	ND – 1.1	2.5	0 of 29	9.3[d]	0 of 29
Chromium, Total	3.5 – 159	30	1 of 29	1,500[d]	0 of 29
Copper	2.6 – 183	50	1 of 29	270[d]	0 of 29
Lead	1.5 – 55.6	63	0 of 29	1,000[d]	0 of 29
Nickel	3.8 – 25.8	30	0 of 29	310[d]	0 of 29
Silver	ND	2	0 of 29	180[d]	0 of 29
Zinc	11.2 – 301	109	4 of 29	10,000[d]	0 of 29
Mercury	ND – 0.13	0.18	0 of 29	2.8[d]	0 of 29
Pesticides/PCBs					
Dieldrin	ND – 0.018	0.005	1 of 4	1.4[d]	0 of 4

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 Groundwater.
d - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for Commercial Use.

Soil contamination identified during the RI was addressed during the IRM described in Section 6.2.

Storm Water Infiltration Basin Soil

A total of 15 additional soil samples were collected during the RI from the on-site storm water infiltration basin. The basin has no drainage inlet or outlet so the samples were collected to assess the potential for impacts from storm water runoff originating from the site and surroundings and from current and past manufacturing discharges to the basin.

As shown in Table 3, seven metals (barium, cadmium, chromium, copper, lead, zinc, and mercury) were detected in the storm water basin soil at concentrations exceeding the unrestricted SCOs, but less than the SCOs for industrial use. Chromium and barium, detected at maximum concentrations of 5,830 ppm and 805 ppm respectively were the only metals detected in soil at concentrations above the restricted use SCOs for commercial use. Specifically, chromium and barium were each detected in three soil samples above the commercial SCOs (1,500 ppm and 400 ppm respectively) at concentrations ranging from 3,050 ppm to 5,830 ppm and 588 ppm to 805 ppm respectively. Chromium and barium were both detected in soil samples collected near a discharge point located along the east-side of the storm water basin (Figure 3).

One pesticide, 4,4' DDT, was detected in two of the storm water drainage basin soil samples at concentrations (0.042 ppm and 0.052 ppm) exceeding the Unrestricted SCO (0.0033 ppm). The 4,4' DDT, was not detected above the commercial restricted use SCO (47 ppm).

The primary contaminants present in storm water basin soil are chromium and barium and are associated with storm water runoff from nearby industrial properties, the adjacent rail line, and historic and possibly current discharges to the storm water basin. The primary soil contamination is found in the drainage basin near a corrugated discharge pipe (Figure 3).

Table 3 – Storm Water Infiltration Basin Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Use SCG (ppm)[c]	Frequency Exceeding Restricted SCG
Inorganics					
Barium	19 – 805	350	4 of 15	400	3 of 15
Cadmium	0.11 – 6.9	2.5	2 of 15	9.3	0 of 15
Chromium, Total	10.9 – 5,830	30	13 of 15	1,500	3 of 15
Copper	6.3 – 253	50	6 of 15	270	0 of 15
Lead	1.8 – 112	63	4 of 15	1,000	0 of 15
Zinc	21.1 – 1,160	109	8 of 15	10,000	0 of 15
Mercury	ND – 0.31	0.18	3 of 15	2.8	0 of 15
Pesticides/PCBs					
4,4'-DDT	ND – 0.052	0.0033	2 of 4	1.7[d]	0 of 4

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 Commercial Use.
d - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for Residential Use.

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

Standing Water in Storm Water Infiltration Basin

Water samples were collected during the RI from the periodic surface water that accumulates in the on-site storm water infiltration basin. The basin has no surface water inlet or outlet so the samples were collected to assess the surface water conditions on-site. The drainage basin receives storm water, including roof water, and manufacturing discharges from the Barthelmes Manufacturing Site, along with storm water runoff from surrounding properties. The results indicate that two metals (chromium and lead) are present in this storm water at concentrations slightly above the Department’s SCGs for Class GA surface water. Specifically, chromium was detected at concentrations of 53 and 180 ppb and above the SCG of 50 ppb in two water samples. Lead was detected in one surface water sample at a concentration of 45 ppb and marginally above the SCG of 25 ppb.

No PCBs, pesticides, SVOCs, or VOCs were detected in the on-site storm water.

Soil Vapor

Soil vapor intrusion sampling was completed in the site building by the owner under the Brownfield Cleanup Agreement and prior to the start of the RI. Off-site soil vapor intrusion sampling was not completed during the RI because of the distance to surrounding properties combined with the industrial use of the surrounding properties.

The evaluation of the potential for soil vapor intrusion resulting from the presence of site related soil or groundwater contamination was evaluated by the sampling of sub-slab soil vapor beneath the site building and indoor air within the site building. At this site due to the presence of buildings in the impacted area a full suite of samples were collected to evaluate whether soil vapor intrusion was occurring.

A total of six (6) subslab soil vapor and six (6) indoor air samples were collected from the site building and one ambient air sample was collected outside of the site building. The samples were collected to assess the potential for soil vapor intrusion. The results indicate that TCE and TCE breakdown products are present in sub-slab vapor and indoor air of the site building. Based on a comparison to Soil Vapor/Indoor Air Matrix 1 and Matrix 2 included in the NYSDOH SVI guidance, action to address soil vapor intrusion in the site building is necessary.

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 and TCE breakdown products.

Exhibit B

Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (Table in Exhibit E) to address the contaminated media identified at the site as described in Exhibit A. Due to the site conditions and the overall nature and extent of contamination, the alternatives are separated into alternatives that address contaminants present in groundwater and alternatives that address contaminants present in storm water infiltration basin soil. Three groundwater alternatives are discussed below, followed by two soil alternatives, and one alternative to achieve restoration to pre-disposal conditions. Exhibit D (Summary of the Proposed Remedy) provides a summary of the preferred soil alternative that when combined with the preferred groundwater alternative most effectively eliminates or mitigates significant threats to public health and the environment and achieves SCGs.

With the completion of interim remedial measures (IRMs) to address soil contamination at the site, the alternatives described below were developed to address the remaining groundwater and soil contamination.

With the exception of the No Further Action Alternative, the following common elements will be included as part of the final site remedy:

- Periodic monitoring of on-site and off-site groundwater quality and on-site surface water quality;
- An environmental easement to restrict the use of groundwater at the site and limit use and development of the property to commercial use consistent with current zoning. The remedy will meet the restricted residential SCOs with the exception of the storm water infiltration basin which will achieve the commercial use SCOs. Achieving commercial SCOs is consistent with the current zoning of the property for industrial use;
- The potential for soil vapor intrusion into the site building will be evaluated, and if necessary, actions recommended to address exposures related to soil vapor intrusion would be implemented;
- A provision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- Floor drains located within the Barthelmes Manufacturing building that discharge to the on-site storm water infiltration basin will be closed to prevent continued discharge of manufacturing wastes to the on-site surface water basin; and
- Periodic reviews to evaluate the proposed remedy and certify that the remedial measures remain in-place.

Groundwater Alternative 1: No Further Action

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

Groundwater Alternative 2: No Further Action with Site Management

The No Further Action with Site Management Alternative recognizes the remediation of the site completed by the IRMs described in Section 6.2 and Site Management, which includes Engineering Controls and Institutional Controls, is necessary to confirm the effectiveness of the IRM. This alternative maintains engineering controls and includes institutional controls, in the form of an environmental easement and site management plan, necessary to protect public health and the environment from contamination remaining at the site. The engineering controls (ECs) would include the permanent closure of the interior floor drains to eliminate the discharge of additional contaminants into the surface water drainage impoundment and the installation of a sub-slab depressurization system should the soil vapor intrusion evaluation to determine if soil vapor intrusion is occurring and if mitigation is necessary. As part of the site management plan, groundwater and surface water monitoring would be conducted to ensure that the remedy is effective and that contaminant concentrations are decreasing over time.

Present Worth: *$142,000*
Capital Cost: *$44,000*
Annual Costs: *$6,400*

Groundwater Alternative 3: Enhanced Bioremediation

This alternative would include in-situ enhanced bioremedation to reduce contaminant concentrations within the three areas where the remnant groundwater contaminant concentrations are the highest and to achieve chemical-specific SCGs. Specifically, Alternative 3 includes the addition of a biological amendment into the groundwater within the three source areas using the horizontal injection wells installed during the earlier IRM excavation activities (Section 6.2). Through the injection of approximately 45,000 pounds of Regenesis 3-D Microemulsion (or similar biological amendment product), this alternative would treat an approximate 375 foot by 450 foot area of the site. The amendments used for in-situ enhanced biodegradation are typically long-lasting and migrate with groundwater flow, and therefore are expected to fully influence the impacted areas. It is anticipated that the total dose of amendments would be divided into two injection events spaced approximately 6 to 12 months apart.

Enhanced biodegradation would treat the plume as the biological amendment is added to the treatment zone and flows with groundwater downgradient of the treatment area. Long-term groundwater monitoring within the treatment zones and downgradient of the source areas would be conducted for up to 30 years.

It is expected that it would take approximately one (1) year to design and implement the remedy. Costs are based on completing bench-scale testing, purchase and injection of the biological amendments for two (2) events, and long-term groundwater, surface water, and soil vapor intrusion monitoring.

Present Worth: *$368,000*
Capital Cost: *$270,000*
Annual Costs: *$6,400*

Groundwater Alternative 4: In-Situ Chemical Oxidation

To remediate residual groundwater contamination on-site as part of Groundwater Alternative 4, an in-situ chemical oxidant (ISCO) would be introduced into the groundwater to chemically break down the site contaminants. A variety of chemical oxidants and application techniques are commercially available. For this alternative, it is assumed that sodium permanganate will be used as the oxidant. To define the specific materials and equipment appropriate for the site however, a bench scale pilot test would be completed under this alternative.

Under Groundwater Alternative 4, ISCO would be introduced into the three source areas using the horizontal injection wells installed during the earlier IRM excavation activities (Section 6.2) during two separate events to reduce the dissolved-phase contaminant concentrations. The ISCO would be introduced into a subsurface treatment zone that extends from approximately 6 feet to 10 feet beneath the ground surface. To treat contaminated groundwater outside the influence of the existing injection wells, a total of approximately 5 additional temporary injection wells spaced approximately 25 feet apart would also be used to introduce the ISCO throughout each of the treatment zones. The ISCO injections would treat an approximate 375 foot by 450 foot area. In total, it is expected that approximately 100,100 pounds of sodium permanganate would be injected at a 10% solution in the three areas.

As with Groundwater Alternative 3, the components of Groundwater Alternative 4 are readily implementable technologies. Costs are based on design of the injection program, completion of bench-scale testing, purchase and injection of the ISCO material, and long-term groundwater, surface water, and soil vapor monitoring. It is expected that it would take approximately six months to design and implement the remedy and approximately one year to remediate the majority of the contamination.

Present Worth:..*$933,000*
Capital Cost:..*$835,000*
Annual Costs:...*$6,400*

Groundwater Alternative 5: In-Situ Electrical Resistive Heating

This alternative would include, in-situ thermal treatment of the groundwater using electrical resistance heating (ERH). Electrical resistance heating relies on electricity that is applied to electrodes installed underground to create a current flow to heat the groundwater to cause the contaminants to volatilize (evaporate) from the groundwater. Implementation of this alternative would consist of the installation of approximately 98 electrodes located on-site in the three areas where the groundwater contaminant concentrations are the highest. The electrodes would be installed approximately 15 to 20 feet apart. To capture vapors generated during the heating process, vapor recovery extraction wells would be installed in each of the three areas. Following recovery, the vapors would require further ex-situ treatment. Typically, the VOC vapors are treated using conventional methods, including granular activated carbon (GAC) or oxidation. A pre-design investigation would be completed to fully define the details of this alternative.

It is expected that it would take approximately four months to design and implement the remedy and approximately four months for remediation. Costs are based on completing a pre-design investigation, installation and operation of the thermal treatment system, and periodic groundwater, surface water, and soil vapor intrusion monitoring.

Present Worth:...*$3,500,000*
Capital Cost:...*$3,400,000*
Annual Costs:...*$6,400*

Soil Alternative 1: No Further Action

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

Soil Alternative 2: Permanent Cap

This alternative would include, placing a composite cap consisting of a non-woven filtering geotextile and a one-foot thick layer of filter sand over the storm water basin to prevent exposure to contaminated soil. The cap would be constructed to continue to convey storm water runoff to the subsurface. Specifically, the geotextile would have a permeability of approximately 0.2 cm/sec and would be overlain by a (1) foot thick of filter sand.

Under this alternative, the cap would be periodically inspected as part of the site management plan to ensure the integrity of the cap.

Present Worth: *$101,000*
Capital Cost: *$47,000*
Annual Costs: *$3,500*

Soil Alternative 3: Targeted Soil Removal at Storm Water Outfall and Off-Site Disposal

This alternative would include the targeted removal of soil over an approximate 1,000 square foot area near the industrial discharge point. The targeted removal would return the storm water basin soil to below the Commercial Use SCOs. The removal area would extend 10 feet north and south of the outfall and would be bounded by the west and east side of the storm water basin for a width of approximately 50 feet. Excavation would extend to depths of approximately two feet beneath the current surface. In total, approximately 110 tons of contaminated soil will be excavated for off-site disposal as part of this alternative. Excavation would be conducted using a standard track-mounted excavator. The excavated material would be directly loaded into dump trucks for off-site disposal at a permitted facility.

The excavation area would be backfilled with clean fill that meets DER-10 certification requirements; likely sand to original grade. Backfill material placement would be conducted using general construction equipment, similar to that of excavation activities. Following excavation, the storm water basin would be restored to current conditions.

It is expected that it would take approximately one (1) year to design and implement the targeted excavation remedy. Costs are based on removal, transportation, and off-site disposal of the contaminated soil.

Present Worth: *$38,000*
Capital Cost: *$38,000*

Combined Alternative 1: Restoration to Pre-Disposal Conditions Alternative - Excavation and Off-Site Disposal of Soil Combined with In-Situ Chemical Oxidation for Groundwater

This alternative achieves all of the SCGs discussed in Section 6.1.1 and Exhibit A and soil meets the unrestricted soil clean objectives listed in Part 375-6.8 (a). This alternative would include excavation and off-site disposal of all soil contamination above the unrestricted soil cleanup objectives combined with in-situ chemical oxidation for groundwater on site.

This alternative was developed to restore the Barthelmes Manufacturing site soil, groundwater, and soil vapor to pre-disposal conditions. To achieve pre-disposal conditions at the site, this alternative would rely on excavation and off-site disposal to remove site contaminants in soil at concentrations that exceed the unrestricted SCOs. In addition to source removal, this alternative would include the introduction of an in-situ chemical oxidant (ISCO) to the overburden and shallow bedrock groundwater to chemically break down the site contaminants.

The restoration to pre-disposal alternative would include the excavation and off-site disposal of approximately 2,500 tons of soil at the site where contamination was identified at concentrations exceeding the unrestricted SCOs. Specifically, the restoration to pre-disposal alternative would include the excavation of soil from five localized areas of the site. This would include excavation of metals contaminated soil from beneath the central portion of the site building, from the former drum storage area, from an undeveloped area west of the site building, and from the storm water infiltration basin. Excavation to remove soil contaminated with dieldrin above the unrestricted SCO would also occur as part of this alternative in an area west of the site building. Each excavation would occur within an approximately 15 feet by 15 feet area, with the exception of the excavation beneath the site building which would be approximately 15 feet by 25 feet in area and the storm water infiltration basing which would be 140 feet by 65 feet in area. In each of the five areas, soil would be excavated to a depth of approximately five feet below the ground surface to achieve the unrestricted SCOs. Following removal of contaminated soil, the excavations would be backfilled with clean fill from an approved source and appropriate restoration would be made to the surface (i.e. concrete, asphalt, or grass seed).

For the on-site CVOC contamination in groundwater, the restoration to pre-disposal alternative would rely on in-situ chemical oxidation. Sodium permanganate would be injected into the overburden groundwater using the three injection wells that were installed during the IRMs (Section 6.2) and with a series of overburden and bedrock injection wells. The sodium permanganate would be introduced into a subsurface treatment zone that extends from approximately 6 feet to 30 feet beneath the ground surface. The ISCO injections would be completed in an approximate 375 foot by 450 foot area where contaminants are present in site groundwater. Approximately 900,000 pounds of sodium permanganate will be used at a 10% solution. The ISCO would be injected during four events over a one year period.

The components of the restoration to pre-disposal alternative are readily implementable and reliable technologies. Costs are based on removal and off-site disposal of the soil from the five excavation areas, backfilling of the excavations, design of the in-situ chemical oxidation program, and the purchase and injection of the ISCO material. It is expected that it would take approximately twelve months to design and fully implement the restoration to pre-disposal remedy.

The remedy will not rely on institutional or engineering controls to prevent future exposure. There is no Site Management, no restrictions, and no periodic review. This remedy will have no annual cost; only the capital cost.

Capital Cost:...$3,600,000

Exhibit C

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
GROUNDWATER ALTERNATIVES			
Groundwater Alternative 1: No Further Action	0	0	0
Groundwater Alternative 2: No Further Action with Site Management	44,000	6,400	142,000
Groundwater Alternative 3: Enhanced Bioremediation	270,000	6,400	368,000
Groundwater Alternative 4: In-Situ Chemical Oxidation	835,000	6,400	933,000
Groundwater Alternative 5: In-Situ Electrical Resistive Heating	3,400,000	6,400	3,500,000
SOIL ALTERNATIVES			
Soil Alternative 1: No Further Action	0	0	0
Soil Alternative 2: Permanent Cap	47,000	3,500	101,000
Soil Alternative 3: Targeted Soil Removal at Storm water Outfall and Off-Site Disposal	38,000	0	38,000

Restoration to Pre-Disposal or Unrestricted Conditions Alternative	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
	3,600,000	0	3,600,000

Proposed Remedy	Capital Cost ($)	Annual Costs ($)	Total Present Worth ($)
Groundwater Alternative 3 combined with Soil Alternative 3 and Common Remedial Elements	308,000	6,400	406,000

Exhibit D

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing the following remedy for the site:

1) Groundwater Alternative 3: Enhanced Bioremediation,
2) Soil Alternative 3: Targeted Soil Removal at Storm Water Outfall and Off-Site Disposal, and
3) The common elements listed in Exhibit B (Description of Remedial Alternatives).

This combination of Alternatives would achieve the remediation goals for the site by adding biological amendments to facilitate the continued break down of the residual groundwater contamination, removing the soil with metals exceeding SCOs from the storm water infiltration basin, and monitoring groundwater, surface water, and soil vapor to assess the effectiveness of the remedy and determine if additional remedial action is necessary. The elements of this remedy are described in Section 7. The proposed remedy is depicted in Figure 4.

Basis for Selection

The proposed 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 proposed remedy (Groundwater Alternative 3 combined with Soil Alternative 3) would satisfy this criterion by facilitating the continued break down of the residual contamination in groundwater and by removing contaminated soil from the storm water basin. Groundwater Alternative 3 (Enhanced Bioremediation) addresses the remaining groundwater contamination, which is the most significant threat to public health and the environment. Alternative 1 (No Further Action) for both groundwater and soil does not provide any protection to public health and the environment and will not be evaluated further. The Restoration to Pre-Disposal Conditions Alternative, by removing all soil contaminated above the unrestricted soil cleanup objectives and by treating groundwater contamination above the drinking water standards, meets the threshold criteria.

Similar to Groundwater Alternative 3 (Enhanced Bioremediation), Groundwater Alternatives 4 and 5 (ISCO and ERH) are protective of public health and the environment by destroying contaminants that remain in groundwater. Groundwater Alternative 2 (No Further Action with Site Management) provides the least amount of protection to human health and the environment because it relies on institutional controls with no active removal of site contaminants.

Soil Alternatives 2 and 3 are each protective of human health and the environment. Soil Alternative 3, involving the removal of the most contaminated soil from the area near the outfall, is the most protective, and Soil Alternative 2 involving a cap and no removal of contaminated soil is the least protective.

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.

Groundwater Alternative 3 combined with Soil Alternative 3 complies with SCGs to the extent practicable. It addresses areas of soil contamination and creates the conditions necessary to restore groundwater quality. Groundwater Alternatives 4 (ISCO) and 5 (ERH) and the Restoration to Pre-Disposal Conditions Alternative, also comply with this criterion. Because these alternatives satisfy the threshold criteria, the remaining balancing criteria are particularly important in selecting a final remedy for the site.

Soil Alternative 2, involving a cap, does not meet the SCGs since contaminated soil is not removed from the site. Soil Alternative 3 (Targeted Excavation) removes soil containing metals at concentrations exceeding the commercial use SCOs.

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.

Achieving long-term effectiveness is best accomplished by removal of the contaminated soil and destruction of the groundwater contaminants. With the excavation and off-site disposal of contaminated soil from the storm water basin as part of Soil Alternative 3, this alternative would be the most effective in the long-term. Soil Alternative 2 does not involve removal of contaminated soil, but instead relies on the long-term effectiveness of a barrier cap.

With the exception of Groundwater Alternative 2 (No Further Action with Site Management), each of the Groundwater Alternatives provides long-term effectiveness by treating residual CVOC groundwater contamination in the three former source areas. The long-term effectiveness of Groundwater Alternatives (3 and 4) and the Restoration to Pre-Disposal Conditions Alternative, is highly dependent on obtaining contact between the injected material and the site contaminants. Overall, the injection of chemical oxidants (Groundwater Alternative 4) would more rapidly destroy site contaminants than the use of enhanced bioremediation (Groundwater Alternative 3). Data collected during the RI suggests that bioremediation is already occurring under the existing conditions however, and that the addition of biological amendments under Groundwater Alternative 3 is expected to further enhance the long-term breakdown of the site contaminants. Through thermal destruction, Groundwater Alternative 5 (ERH) is more effective and permanent than Groundwater Alternatives 3 and 4. For Groundwater Alternative 2, site management remains effective, but is less desirable in the long term relative to the groundwater treatment options (Groundwater Alternative 3, 4, and 5).

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.

With the exception of Groundwater Alternative 2 (No Further Action with Site Management) each of the Groundwater Alternatives relies on in-situ remedial approaches to permanently reduce the toxicity, mobility, and volume of site contaminants. Groundwater Alternative 5 (ERH) reduces contaminant toxicity and volume by introducing high temperatures to destroy the CVOCs. Alternatives 3 and 4 (Enhanced Bioremediation and ISCO respectively) reduce toxicity and volume of the site contaminants but mobility of residuals may be increased. To achieve the complete reduction of toxicity, mobility, and volume of site contaminants, both Alternatives 3 and 4 would rely on repeat injections of the biological amendment or the chemical oxidant respectively.

Soil Alternative 3 will significantly reduce the toxicity, mobility, and volume of on-site waste by transferring the material to an approved off-site location where it will be disposed of at a permitted facility. Soil Alternative 2 does not reduce the overall toxicity, mobility and volume of contaminants, but instead provides a barrier cap to isolate the contaminants.

5. <u>Short-term Impacts and Effectiveness.</u> 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.

Groundwater Alternative 2 (No Further Action with Site Management) is the easiest groundwater alternative to implement since it would only require long-term monitoring. Groundwater Alternative 4 (ISCO) and the Restoration to Pre-Disposal Conditions Alternative present challenges due to the short term transport, storage, and handling of a strong chemical oxidizer. Groundwater Alternative 5 presents challenges with the large number of required electrodes and the need to introduce high subsurface temperatures. With the use of a food-grade type product to enhance biological activity and the breakdown of the site contaminants, Groundwater Alternative 3 has little to no short term impacts during remedy implementation.

Groundwater Alternative 3 does provide benefits in the short term with reductions in contamination concentrations, but this approach typically takes longer to be effective in meeting groundwater SCGs than ISCO and ERH (Groundwater Alternatives 4 and 5 respectively.) Overall, the time needed to achieve the remediation goals is the shortest for Groundwater Alternative 5 (ERH) and the Restoration to Pre-Disposal Conditions Alternative and longest for Alternative 2 (No Further Action with Site Management).

Both Soil Alternatives 2 and 3 would be implemented in an unused portion of the site using standard construction procedures. The placement of a cap over the entire storm water basin (Soil Alternative 3) would require more material transported via truck to the site and would therefore be more disruptive to the surrounding community and site workers than the targeted soil removal (Soil Alternative 2).

6. <u>Implementability.</u> 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.

Each of the Soil and Groundwater alternatives involves technologies that have been applied by the Department and are implementable. The handling of chemical oxidizers and the introduction of high subsurface temperatures make Groundwater Alternatives 4 (ISCO) and 5 (ERH) slightly more difficult to implement than Groundwater Alternative 3 (Bioremediation). Both Groundwater Alternatives 3 (Bioremediation) and 4 (ISCO) would require bench scale testing to be implemented, where Groundwater Alternative 5 (ERH) would require a pre-design investigation to be implemented. Groundwater Alternative 5 (ERH) would also require the installation of a temporary electrical supply and the installation soil vapor extraction wells. It is expected that the Restoration to Predisposal Conditions Alternative would be the most difficult to implement because it would involve the transport of approximately 900,000 pounds of sodium permanganate, mixed on-site to a 10% solution and injected into each of the three former source areas. Overall, Alternatives 2 (No Further Action with Site Management) and 3 (Bioremediation) are favorable in that they can be readily implemented to address the residual groundwater contamination at the site.

Both Soil Alternatives 2 and 3 would be implemented using standard construction means and methods. The placement of a cap over the entire storm water basin would necessitate increased truck traffic on local roads for several months and would therefore be more disruptive to the surrounding community. Soil Alternative 3 (Targeted Soil Removal) would involve the removal of only 110 tons of contaminated soil and would require less than six trucks to transport the contaminated soil from the site for disposal.

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.

The costs of the groundwater alternatives vary significantly. Groundwater Alternative 2 has the lowest cost ($142,000), but the contaminated groundwater would not be addressed other than by institutional controls. With its need for a separate electrical source, installation of nearly 100 electrodes, along with its high energy demand to increase subsurface temperatures, Groundwater Alternative 5 (ERH) would have the highest present worth cost ($3,500,000). Enhanced Bioremediation (Groundwater Alternative 3) would be much less expensive than In-Situ ISCO (Groundwater Alternative 4), yet it would provide equal destruction of the groundwater contaminants. The Restoration to Pre-Disposal Conditions Alternative would be implemented in less than one year and has the highest overall capital cost ($3,600,000).

The capital costs of Soil Alternatives 2 (Capping) and 3 (Targeted Soil Removal) are similar to each other, although the present worth cost for Alternative 2 would be higher than that of Alternative 3. The long-term monitoring and maintenance cost of the capped area under Soil Alternative 2 cause the present worth cost for this alternative to be slightly higher than Soil Alternative 3 (Targeted Soil Removal).

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.

With the anticipated use of the site as commercial; which also allows for industrial use, both Soil Alternative 2 (Capping) and 3 (Targeted Excavation) were designed to achieve continued commercial use of the site. Soil Alternative 2, would be less desirable because contaminated soil would remain on the property at concentrations above commercial SCOs, whereas Soil Alternative 3 would remove the contaminated soil. However, the residual metals contamination under Soil Alternative 2 would be addressed using a cap along with implementation of a Site Management Plan. Overall, each of the alternatives considered achieves the commercial use cleanup objectives for the site contaminants which is entirely consistent with the current and future use of the site.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is 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 proposed remedy, notices to the public will be issued describing the differences and reasons for the changes

Groundwater Alternative 3, combined with Soil Alternative 3 is being proposed because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.

The table included as Exhibit E summarizes how the combination of Groundwater Alternative 3 (Enhanced Bioremediation) and Soil Alternative 3 (Excavation and Off-Site Disposal) along with the common remedial elements will achieve the remediation objectives.

Exhibit E

SUMMARY OF SELECTED REMEDIAL ACTIONS TO MEET REMEDIAL OBJECTIVES

Remedial Action Objectives (RAOs) for Protection of Public Health and the Environment	Selected Remedial Actions for Protection of Public Health and the Environment
Groundwater RAOs for Protection of Public Health	
Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards	- Achieved by prohibiting groundwater use as an Institutional Control. - Achieved by developing a Site Management Plan that will include protocols to safely handle groundwater encountered during excavation activities. - Achieved by the connection to public water that is provided to this area.
Prevent contact with, or inhalation of volatiles, from contaminated groundwater	- Achieved by removing source areas as Interim Remedial Measures in the Former Drum Storage Area, Outside Disposal Area, and the Former Vapor Degreaser Area. - Achieved by introducing biological amendments into injection wells installed during the IRMs to further reduce residual groundwater contamination. - Achieved by developing a Site Management Plan that includes periodic groundwater monitoring and a contingency for additional in-situ applications of biological amendments in former source areas to further reduce residual groundwater contamination, if necessary. - Will be achieved by evaluating on-site soil vapor intrusion and if necessary, actions to address exposures related to soil vapor intrusion.
Groundwater RAOs for Environmental Protection	
Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable	- Achieved by removing source areas as Interim Remedial Measures in the Former Drum Storage Area, Outside Disposal Area, and the Former Vapor Degreaser Area. - Achieved by introducing biological amendments into injection wells installed during the IRMs to reduce residual groundwater contamination. - Achieved by developing a Site Management Plan that includes periodic groundwater monitoring and a contingency for additional in-situ applications of biological amendments in former source areas to further reduce residual groundwater contamination, if necessary.
Remove the source of ground or surface water contamination	- Achieved by removing source areas as Interim Remedial Measures in the Former Drum Storage Area, Outside Disposal Area, and the Former Vapor Degreaser Area. Based on these remedial actions, there are no remaining soil sources of ongoing groundwater contamination.
Prevent the discharge of contaminants to surface water	- Achieved by closing building floor drains that discharge directly to the storm water infiltration basin.
Soil RAOs for Protection of Public Health	
Prevent ingestion/direct contact with contaminated soil	- Will be achieved by removing approximately 110 tons of contaminated soil from the storm water infiltration basin. - Achieved by closing building floor drains that directly discharge to the storm water infiltration basin. - Achieved by removing source areas as Interim Remedial Measures in the Former Drum Storage Area, Outside Disposal Area, and the Former Vapor Degreaser Area.

	- Achieved by developing a Site Management Plan that will include protocols to safely handle soil and prevent future exposure potential. - Currently the building slab covers any potential unknown contaminated soil and if the cover is removed, the excavation requirements will apply.
Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.	- Achieved by removing source areas as Interim Remedial Measures in the Former Drum Storage Area, Outside Disposal Area, and the Former Vapor Degreaser Area. - Will be achieved by evaluating on-site soil vapor intrusion and if necessary, actions to address exposures related to soil vapor intrusion.
Soil RAOs for Environmental Protection	
Prevent migration of contaminants that would result in groundwater or surface water contamination	- Achieved by removing source areas as Interim Remedial Measures in the Former Drum Storage Area, Outside Disposal Area, and the Former Vapor Degreaser Area. Based on these remedial actions, there are no remaining soil sources of ongoing groundwater or surface water contamination. - Achieved by introducing biological amendments into injection wells installed during the IRMs to reduce residual groundwater contamination.
Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain	- Achieved by removing source areas as Interim Remedial Measures in the Former Drum Storage Area, Outside Disposal Area, and the Former Vapor Degreaser Area. Based on these remedial actions, there are no remaining soil sources of ongoing groundwater or surface water contamination.
Soil Vapor RAOs for Protection of Public Health	
Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the site	- Will be achieved by evaluating on-site soil vapor intrusion and if necessary, actions to address exposures related to soil vapor intrusion. - Achieved by removing source areas as Interim Remedial Measures in the Former Drum Storage Area, Outside Disposal Area, and the Former Vapor Degreaser Area. - Achieved by introducing biological amendments into injection wells installed during the IRMs to reduce residual groundwater contamination. - Achieved through the natural attenuation of onsite residual soil and ground water contamination.

FIGURES

Path: S:\Data\N\NEWEN - NY STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION\BARTHELMES - 15 CAIRN STREET, ROCHESTER\NEW9624P2\GIS\Site Location.mxd

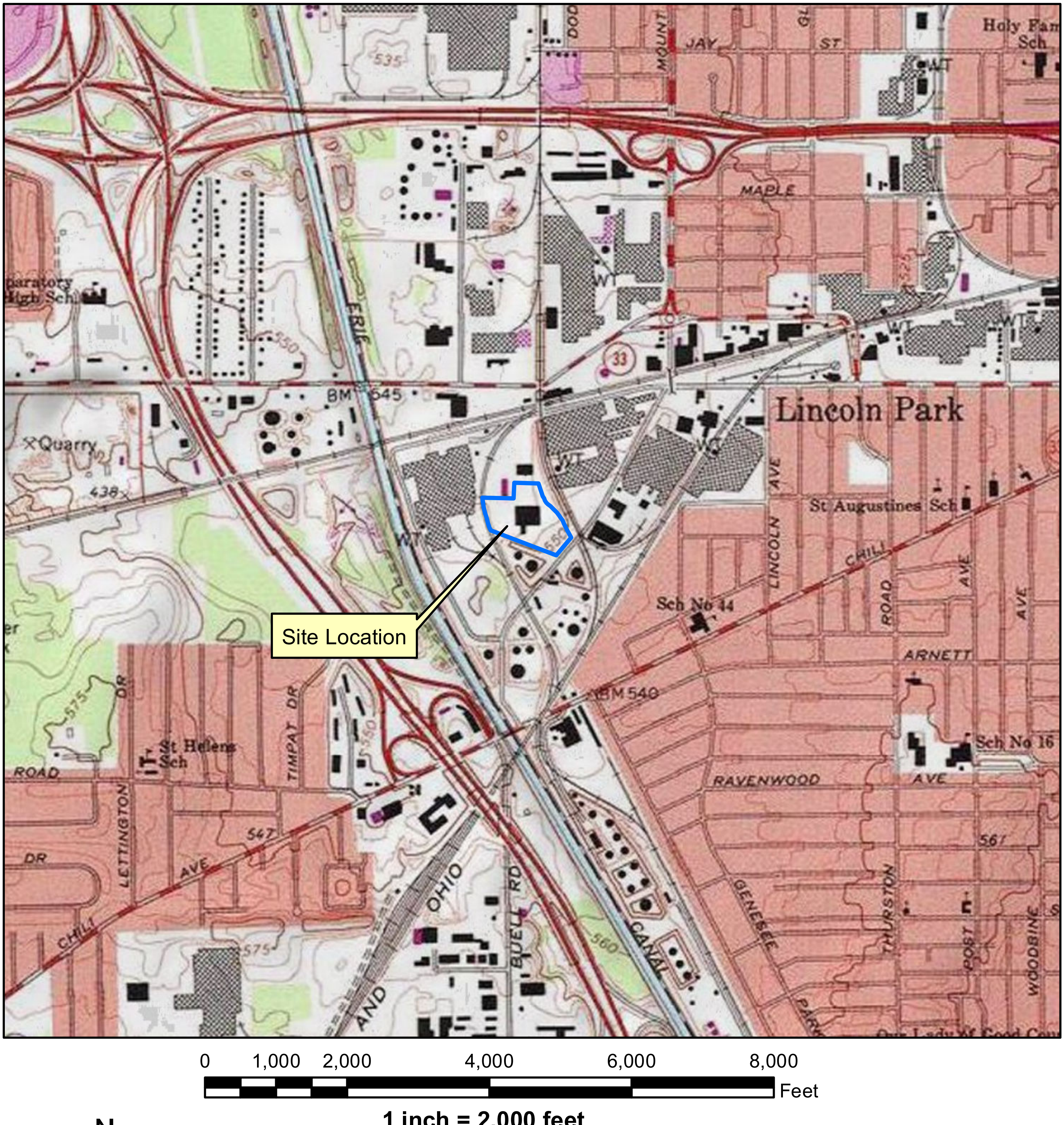

Figure 1
Site Location Map
Barthelmes Manufacturing
15 Cairn Street
Rochester, New York
HRP # NEW9624.P2
Scale 1" = 2,000'

HRP Associates, Inc.
Environmental/Civil Engineering & Hydrogeology
Creating the Right Solutions Together
Offices in CT, SC, NY, FL, MA and TX
1 Fairchild Square, Suite 110
Clifton Park, NY 12065
Ph:(518)877-7101 Fax:(518)877-8561
www.hrpassociates.com

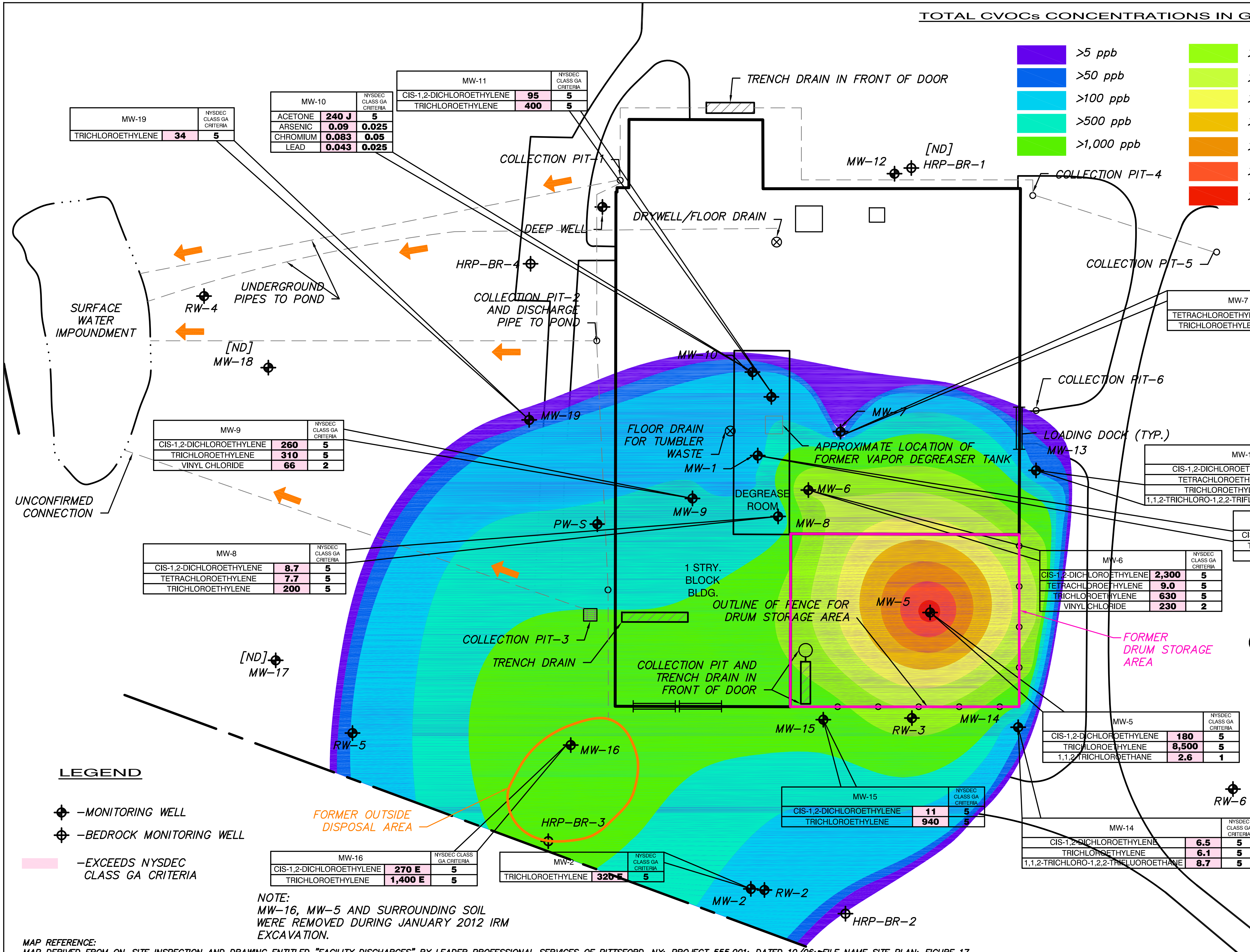

FIGURE 2
OCTOBER 2011
TOTAL GROUNDWATER CVOC CONCENTRATIONS
BARTHELMES MANUFACTURING SITE
15 CAIRN STREET
ROCHESTER, NEW YORK
HRP # NEW9624.P2
SITE ID: 828122
NOT TO SCALE

HRP Associates, Inc.
Environmental/Civil Engineering & Hydrogeology
Creating the Right Solutions Together
Offices in CT, SC, NY, FL, MA, TX and PA
1 Fairchild Square, Suite 110
Clifton Park, NY 12065
Ph:(518)877-7101 Fax:(518)877-8561
www.hrpassociates.com

Figure 3
Site Features and IRM Location Map

February 2013
Proposed Remedial Action Plan

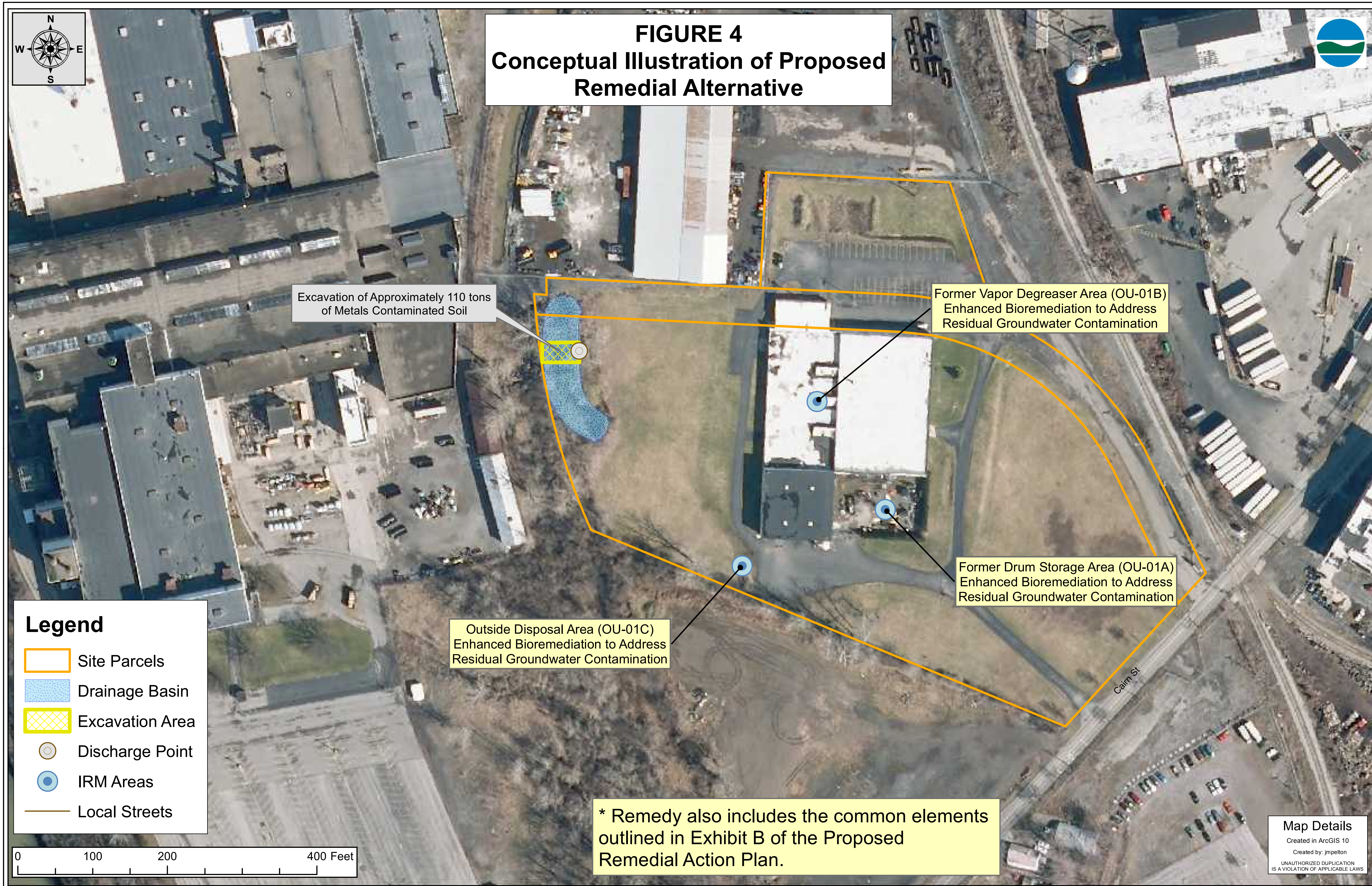

FIGURE 4
Conceptual Illustration of Proposed Remedial Alternative