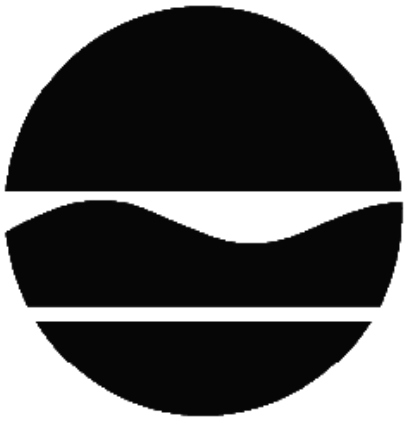
PROPOSED REMEDIAL ACTION PLAN

Former Kenco Chemical Company, Inc.
Operable Unit Number 02: Source Area
107 Freemans Bridge Road
State Superfund Project
Glenville, Schenectady County
Site No. 447039
February 2015



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

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Site No. 447039
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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.

This PRAP addresses only a portion of the environmental contamination which resulted from a release of chlorinated solvents, primarily tetrachloroethene (also referred to a PCE), at 107 Freemans Bridge Road (the site). PCE was released at the site property, soaked into the ground and has migrated extensively in the groundwater. Operable Unit 02 Source Area (OU 02), the subject of this PRAP, was created to address the environmental media most significantly affected by the release of chlorinated solvents at the site, material which continues to act as a source of groundwater contamination and continued contaminant migration.

The areal extent of OU 02 is shown on Figure 3. A portion of OU2, the on-site and immediately adjacent off-site area, includes media which has been directly impacted by the release of chlorinated solvents at the site. This area includes the unsaturated zone soil (soil above the groundwater table) as well as the soil and groundwater in the saturated zone found immediately below the unsaturated zone source material.

The remainder of OU 02 is comprised of soil and groundwater in the saturated zone immediately downgradient of the area described above. Contamination of this media was the result of source material migrating from the site via groundwater. The contamination of the saturated soil and groundwater in this area is significant, and the saturated soil is acting as source material for further contaminant migration.

The entirety of the contamination which has migrated off-site will be addressed under a different operable unit, Operable Unit 01 Off-site Contamination. A PRAP for OU 01 will be issued for public comment in the future.

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:

Glenville Public Library
Attn: Reference Librarian
20 Glenridge Rd
Glenville, NY 12302
Phone: 518-386-2243

A public comment period has been set from:

2/27/2015 to 3/27/2015

A public meeting is scheduled for the following date:

3/18/2015 at 7:00 PM

Public meeting location:

Glenville Town Offices, 18 Glenridge Road, Glenville, New York

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 3/27/2015 to:

Christopher O'Neill
NYS Department of Environmental Conservation
Division of Environmental Remediation
1130 North Westcott Rd
Schenectady, NY 12306
christopher.oneill@dec.ny.gov

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 Former Kenco Chemical Company (the site) is located at 107 Freemans Bridge Road, in a primarily commercial area, with adjacent farmland and some residential properties nearby. The site is approximately 0.86 acres in size.

SITE FEATURES: The main site features include a large warehouse building, a small wooden shed, several concrete slabs/tank supports, and an unnamed creek with associated wetlands between the site and adjacent railroad tracks.

CURRENT ZONING AND LAND USE: The site is a commercial property, with mixed commercial and residential use in the area. As a warehouse location, the on-site buildings are occupied sporadically. The site is zoned General Business and the surrounding area is zoned General Business and Research/Development/Technology.

PAST USE OF THE SITE: The site was used for chemical distribution and warehousing by Kenco Chemical Company Inc. and Voelker Sales Inc. until approximately 1999. The chemicals handled on-site included swimming pool chemicals and dry cleaner chemicals (tetrachloroethene, a.k.a. perc or PCE). The site was purchased by ULTIMATE, LLC in 1999, and the property has been used for general storage and warehousing since that time.

OPERABLE UNITS: The site was divided into two operable units, namely OU 01 Off-site Contamination and OU 02 Source Area. An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination.

SITE GEOLOGY AND HYDROGEOLOGY: Soils consist primarily of silt, sands and clayey layers, with two or more sandy zones divided by clays in many areas across the surrounding area. Depth to bedrock is generally more than 40 feet below ground surface. Depth to water ranges from 3-15 feet below ground surface. The groundwater flows generally south and southeast from the site. An unnamed tributary to Warner Creek runs through the site.

Operable Unit (OU) Number 02 Source Area is the subject of this document.

A Record of Decision will be issued for OU 01 Off-site Contamination in the future.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, an alternative which allows for unrestricted use of the site was evaluated.

A comparison of the results of the investigation against unrestricted use standards, criteria and guidance values (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:

ULTIMATE, LLC

Estate of Kenneth K. Cochrane

Kenco Chemical Company Inc.

Voelker Sales Inc.

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 for OU 02 includes data for:

- groundwater
- surface water
- soil
- sediment
- soil vapor
- 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 for Operable Unit 02 are:

cis-1,2-Dichloroethene	Tetrachloroethene (PCE)
Trichloroethene (TCE)	Vinyl Chloride

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

- groundwater
- surface water
- soil
- soil vapor intrusion

6.2: Interim Remedial Measures

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

The following IRMs have been conducted for the Former Kenco site, within OU 01 and OU 02, based on conditions observed during the RI. (Note that the information for OU 01 IRM activities are being included here only for reference purposes, as these will be addressed more directly by the future PRAP for operable unit OU 01.)

Surface Water and Groundwater Collection and Treatment

An unnamed tributary to Warner Creek flows along the northern property boundary of the site, then crosses the site and becomes contaminated. The contaminated surface water is collected from a sump along the piped section of the creek, before it carries contamination off-site. Contaminated groundwater is extracted from a recovery well immediately downgradient from the site. Since 2009, a remedial system treats the collected groundwater and surface water near the site, and treated water is discharged, approximately 1000 feet away, to another unnamed tributary to Warner Creek.

IRM - EPA Emergency Removal Action

In 2010-2011, USEPA properly disposed of chlorinated solvent and other chemical containers from the on-site buildings. In conjunction with this removal work, USEPA performed a

substantial environmental sampling program for the on-site soils and downgradient soil vapor. (As part of operable unit OU 01 activities, USEPA's emergency actions included: sampling over 100 private supply wells approximately 0.60 miles downgradient of the Site; installing three Point-of-Entry (POET) treatment systems on impacted private wells; and installing sub-slab depressurization systems on two buildings impacted by soil vapor intrusion.)

Sub-Slab Depressurization Systems

Residential and commercial buildings within OU 01 Off-site Contamination are being mitigated for soil vapor intrusion issues via sub-slab depressurization systems (SSDS). Two residential SSDS were installed by the Department 2007, while one residential and one commercial SSDS were installed by USEPA 2010. All of the SSDS have been managed by the Department since 2011.

IRM – Private Water Supply Treatment via POET

Three impacted private water supply wells within OU 01 Off-site Contamination were equipped with point-of-entry (POET) treatment systems by USEPA in 2010. The Department has installed additional POET systems on impacted private wells within OU 01 since that time. As of 2011, the Department maintains and monitors all of the POET systems.

Public Water Supply Line

A design project is underway for the installation of a public water supply for impacted and threatened private potable water supply wells in the Sunnyside Road neighborhood, approximately 0.6 miles south of the site. This IRM will continue with the installation of the supply line and connection of the residences upon design completion.

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 02, 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.

The Source Area, which is the subject of operable unit OU 02, is the origin (source) of the Former Kenco groundwater contaminant plume. The Source Area is defined as the property boundaries of 107 Freemans Bridge Road (the site) and adjacent, downgradient parcels which contain the highest soil and groundwater contaminant concentrations. The Source Area acts as a continuous source of groundwater contamination, which migrates further off-site. Unsaturated zone soils, saturated zone soils and groundwater are contaminated with chlorinated solvents (tetrachloroethene (PCE) and breakdown products trichloroethene (TCE), cis-1,2 dichloroethene (DCE) and vinyl chloride (VC)). These contaminants impact a creek, an unnamed tributary to

Warner Creek that flows through the Source Area. Sampling results in soils and groundwater established the presence of free-phase liquid solvent globules or concentration amounts indicative of free-phase liquids.

Surface Water – Warner Creek and its unnamed tributaries contain site-related chlorinated solvents, with the maximum PCE concentration of 800 parts per billion (ppb) near the site.

Groundwater - Groundwater contamination extends south-southeasterly from the site towards the Sunnyside Road neighborhood, approximately 0.60 miles away. The maximum groundwater concentrations discovered in OU 02 (Source Area) for PCE, TCE, DCE and VC are 71,000 ppb, 6,700 ppb, 7,600 ppb and 240 ppb respectively. PCE, TCE and DCE each have a groundwater standard of 5 ppb, while VC has a groundwater standard of 2 ppb.

Soil - Soil concentrations for the site were investigated extensively by USEPA in 2010, identifying PCE as the most prevalent contaminant. Soil contaminated with PCE, TCE and/or DCE has been found across the entire Former Kenco property, except for the northeastern portion, and extends to more than 20 feet below the ground surface. Unsaturated zone soil contamination extends off-site within OU 02. Saturated soil contamination extends beyond the site and Source Area boundaries. (Saturated soil contamination beyond the OU 02 Source Area is being managed as part of operable unit OU 01 Off-site Contamination.) The maximum soil concentration for PCE within OU 02 is 72,000 parts per million (ppm), with evidence of free-phase solvent globules in several sampling locations.

Soil Vapor - Soil vapor concentrations on-site were measured by field instruments, while soil vapor laboratory data was generated off-site within and beyond the OU 02 designated area, as part of a USEPA Emergency Removal Action. Based on the USEPA's data set, the maximum sub-slab soil vapor concentrations within OU 02 for PCE, and TCE were 920 µg/m3 and 35 µg/m3 respectively.

Sediment - Sediment sampling from the on-site wetland areas demonstrated that no Site-related impacts are present in OU 02 Source Area sediments.

Special Resources Impacted/Threatened: Warner Creek and unnamed tributaries have shown detectable levels of site-related chlorinated solvents.

6.4: Summary of Human Exposure Pathways

The site is not fenced and persons who enter the site could contact contaminants in the soil by walking on the soil, digging or otherwise disturbing the soil. People may come into contact with contaminated groundwater through private wells used for drinking water. Volatile organic compounds in the groundwater may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. There is a potential for people to inhale site-related contaminants due to soil vapor intrusion at the on-site building. Sub-slab depressurization systems (systems that ventilate/remove the air beneath the building) have been installed in off-

site buildings to prevent the indoor air quality from being affected by the contamination in soil vapor beneath the buildings.

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 OU 02 Source Area 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.

Surface Water

RAOs for Public Health Protection

- Prevent ingestion of water impacted by contaminants.
- Prevent contact or inhalation of contaminants from impacted water bodies.

RAOs for Environmental Protection

- Restore surface water to ambient water quality criteria for the contaminant of concern.

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 OU 02 Source Area were identified, screened and evaluated in the FS report.

A summary of the remedial alternatives that were considered for OU 02 Source Area 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 in Exhibit D.

The proposed remedy is referred to as the Excavation and Thermal Treatment with In-Situ Chemical Treatment remedy.

The estimated present worth cost to implement the remedy is $20,500,000. The cost to construct the remedy is estimated to be $20,100,000 and the estimated average annual cost is $89,000.

As detailed below, thermal treatment is being proposed to remediate on-site soil and groundwater to contaminant concentrations that would allow unrestricted future use. Meanwhile, in-situ chemical treatment is proposed for off-site source areas to both eliminate a continuing source of groundwater contamination (by reducing the soil contamination concentrations to levels protective of groundwater) and to significantly reduce the degree of groundwater contamination present. Any engineering or institutional controls ultimately found necessary for the OU 02 Source Area off-site areas, if any, will be defined by and included in the future OU 01 Off-site Contamination remedy.

The elements of the proposed remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;

- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Surface Water Re-routing and Restoration

The creek will be re-routed temporarily to enter and exit the Site without contacting site contaminants. Following successful remediation, the creek will be restored to its natural flow path, between the Site and the railroad property, and continue westerly along the railroad property.

3. Excavation

• Excavation and off-site disposal of soil from 0-2 feet in the area shown on Figure 16. Excavation of surface soil is necessary to facilitate installation of treatment system infrastructure. Significant portions of this surface soil is contaminated with site-related contaminants and will have to be properly disposed off-site. Prior to excavation, all on-site structures will be removed and disposed off-site.

• Approximately 2,800 cubic yards of soil will be removed from the site

• Upon completion of the remedial action, clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to establish the designed grades at the Site.

4. Treatment Remedies

The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

4a. In-situ Thermal Treatment

In-Situ Thermal Treatment will be implemented to destroy or volatilize volatile organic compounds (VOCs) in the on-site and immediately adjacent off-site areas indicated on Figure 13 from a depth of 2 to 40 feet below grade, remediating soil to unrestricted use Soil Cleanup Objectives to a depth of approximately 21 feet and groundwater to a depth of approximately 40 feet. The gases produced by the thermal treatment will be collected by vapor extraction wells and treated in an ex-situ treatment unit.

4b. In-Situ Chemical Oxidation or Reduction

In-situ chemical treatment will be implemented to treat contaminants in groundwater and saturated soils off-site but within the OU 02 Source Area. A chemical oxidant or a chemical reducing agent will be injected into the subsurface to destroy the contaminants via injection wells. The method and depth of injection will be determined during the remedial design.

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation (RI) 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, including surface and subsurface soil, groundwater, surface water, sediment and limited off-site sub-slab soil vapor and indoor air.

For each medium for which contamination was identified, a table summarizes the findings of the investigation. The tables present the range of contamination found at the site in the media and compares the data with the applicable SCGs for the site. The primary contaminants that exceed SCGs are volatile organic compounds (VOCs). The contaminants are arranged into four categories; 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.

Waste/Source Areas

As described in the RI report, waste/source materials were identified at the site and are impacting groundwater, soil, surface water, 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.

The RI confirmed the presence of hazardous waste on-site in the form of dissolved, adsorbed, and free-phase chlorinated solvent chemicals that had been discharged to the surface/subsurface, although the specifics of the historical release(s) are not known. Between 1965 and 1991, tetrachloroethene (PCE, perchloroethylene) was stored on-site in a bulk aboveground storage tank (AST) that utilized buried transfer piping. The OU2 Source Property collectively includes the following at or near surface features: the former tank/piping area, the shed, concrete storage pad, loading dock, and the buried surface water drainage pipe. The OU2 Source Property, which extends under the on-site buildings and off-site onto downgradient parcels, includes subsurface soil in excess of SCGs and dense non-aqueous phase liquid (DNAPL), present at approximately 20 feet below grade. Figures 2 and 3 depict the location of these features. The OU2 Source Property has resulted in VOC impacts to other environmental media, from PCE and its breakdown products, including trichloroethene (TCE), cis-1,2-dichloroethene (DCE) and vinyl chloride (VC).

The waste/source areas identified will be addressed in the remedy selection process. Chemical containers within the site warehouse and shed were removed via IRM emergency response actions (by USEPA) as described in Section 6.2. No evidence was found to indicate that these containers had contributed to site impacts.

Groundwater

Between 2009 and 2013, multiple groundwater samples were collected to assess groundwater conditions on-site (Former Kenco Chemical Company property) and for nearby adjacent parcels. The samples were collected from a network of overburden monitoring wells installed as part of the RI along with existing monitoring wells that were installed during earlier site investigations. Grab groundwater samples were collected using direct push technology at select locations to fill data gaps. As shown on Table 1, the results indicate that contamination in shallow and deep water-bearing zones within OU2 exceeds the SCGs for chlorinated VOCs. Refer to Figure 4 for VOC results in shallow groundwater (5 to 15 feet below grade) and Figure 5 for results in deep groundwater (25 to 40 feet below grade).

Table 1 - Groundwater

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
1,1-Dichloroethene	ND – 29	5	7 out of 50
1,1,2-Trichloroethane	ND – 6	5	1 out of 50
1,2-Dichloropropene	ND – 3.1	5	3 out of 50
Cis-1,2-dichloroethene (DCE)	ND – 7,600	5	32 out of 50
Trans-1,2-dichloroethene	ND – 63	5	7 out of 50
Tetrachloroethene (PCE)	ND – 71,000	5	39 out of 50
Trichloroethene (TCE)	ND – 6,700	5	30 out of 50
Toluene	ND – 12	5	1 out of 50
Vinyl Chloride (VC)	ND – 240	2	13 out of 50
Inorganics			
Iron (Dissolved)	31.7 to 1,360	300	4 out of 7
Sodium (Dissolved)	22,300 to 115,000	20,000	7 out of 7

a - ppb: parts per billion, which is equivalent to micrograms per liter, µg/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).
ND = Not Detected

Based on the findings of the RI, the past disposal of hazardous waste has resulted in the contamination of shallow and deep groundwater as it travels through impacted source material on-site. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: PCE, TCE, DCE, and VC. Figures 6 and 7 show the extent of impacts for the shallow and deep

water-bearing zones, respectively. The two naturally-occurring metals present above SCGs (iron and sodium) are not considered site-related contaminants.

On-site groundwater was also sampled and analyzed for SVOCs, PCBs, pesticides, and cyanide; however, no SCGs were exceeded.

As discussed in Section 6.2, one groundwater recovery well is in operation as part of an Interim Remedial Measure (IRM) for contaminated surface water and groundwater.

Soil

Surface and subsurface soil samples were collected at the site during the RI. Surface soil samples were collected from a depth of 0 to 2 inches to assess direct human exposure. Subsurface soil samples were collected from a depth of 0.5 - 40 feet to assess soil contamination impacts to groundwater. The results indicate that surface soils at the site exceed the unrestricted SCGs for VOCs. These results are summarized in Table 2a. Refer to Figure 8 for the VOC concentrations in surface soil.

Table 2a - Surface Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG
VOCs			
Tetrachloroethene (PCE)	ND – 1.7	1.3	1 of 13
SVOCS			
Benzo(a)anthracene	ND – 1.9	1	1 of 8
Benzo(a)pyrene	ND – 2.2	1	1 of 8
Benzo(b)fluoranthene	ND – 3.0	1	1 of 8
Benzo(k)fluoranthene	ND – 3.0	0.8	2 of 8
Chrysene	ND – 2.3	1	1 of 8
Indeno(1,2,3-cd)pyrene	ND – 1.7	0.5	1 of 8
Inorganics			
Arsenic	4.1 – 41.1	13	1 of 8
Copper	11.7 – 84.7	50	1 of 8
Lead	9.3 – 264	63	1 of 8
Mercury	0.021 – 0.2	0.18	1 of 8
Zinc	40.3 - 392	109	3 of 8

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG
Pesticides/PCBs			
4,4-DDD	ND – 0.12	0.0033	1 of 8
4,4-DDT	ND – 0.18	0.0033	1 of 8
Aroclor 1260	ND – 0.46	0.1	1 of 8
Dieldrin	ND – 0.077	0.005	1 of 8

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.

VOC contamination was detected above SCGs in an off-site location associated with the historical discharge of contaminated surface water prior to interception and treatment via the IRM remedial system. The site contaminant identified in surface soil which is considered to be the primary contaminant of concern, to be addressed by the remedy selection process, is PCE. Surface soil impacts were identified above the Unrestricted Use SCOs for SVOCs, Inorganics, and Pesticides/PCBs. Many of these compounds were identified in only one sample and they are not considered site-related contaminants.

Table 2b – Subsurface Soil

Detected Constituents	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG
VOCs			
Acetone	ND – 0.081	0.05	1 of 58
Cis-1,2-dichloroethene (DCE)	ND – 2.5	0.25	2 of 58
Tetrachloroethene (PCE)	ND – 72,000	1.3	22 of 58
Trichloroethene (TCE)	ND - 45	0.47	4 of 58
Toluene	ND – 4.7	0.7	1 of 58

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.

The results indicate that subsurface soils within OU2 exceed the unrestricted SCGs for VOCs. These results are summarized in Table 2b. Refer to Figure 9 for the VOC concentrations in subsurface soil. The primary soil contaminants are chlorinated VOCs associated with the release(s) of solvent on-site. The extent of VOC impacts to soil are represented on Figure 10.

Based on the findings of the RI, the past disposal of hazardous waste has resulted in the contamination of subsurface soil. The site contaminants identified in subsurface soil which are considered to be the primary contaminants of concern, to be addressed by the remedy selection process are, PCE, TCE, and DCE. Removal of source materials will address the presence of other reported VOCs.

Surface Water

Surface water samples were collected during the RI to assess the surface water conditions on and off-site. The results indicate that contaminants in surface water at the site exceed the Department's SCGs for the four site COCs. The sample locations and results are shown on Figure 11.

Table 3 - Surface Water

Detected Constituents	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
Cis-1,2-dichloroethene (DCE)	ND – 120	5	2 of 3
Tetrachloroethene (PCE)	ND – 440	0.7	1 of 3
Trichloroethene (TCE)	ND – 80	5	1 of 3
Vinyl Chloride (VC)	ND - 7	0.3	2 of 3

a - ppb: parts per billion, which is equivalent to micrograms per liter, µg/L, in water.
b-SCG: Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1) and 6 NYCRR Part 703: Surface Water and Groundwater Quality Standards.

Based on the findings of the RI, the disposal of hazardous waste has resulted in the contamination of surface water. As noted on Figure 12, the primary surface water contamination is in the vicinity of the buried drainage pipe on the western property margin. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of surface water to be addressed by the remedy selection process are, PCE, TCE, DCE, and VC. Exposure to surface water contamination was temporarily mitigated via the groundwater and surface water treatment IRM described in Section 6.2; however the selected remedy will need to address surface water impacts.

Sediments

Sediment samples were collected during the RI from the on-site wetlands to assess the potential for site-related impacts. No VOCs were detected above Freshwater Sediment Guidance Values (Screening and Assessment of Contaminated Sediment, June 2014). Sediment results are provided along with surface water results on Figure 12. Since no site COCs were encountered above SCGs, no media-specific remedial alternatives were evaluated for sediment.

Soil Vapor

No soil vapor intrusion sampling occurred at on-site structures; however, adjacent buildings within OU2 were assessed and further monitoring and/or mitigation was performed as warranted. 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 and indoor air under/inside accessible off-site structures by USEPA in 2010-2011. The USEPA results indicate that PCE and TCE were detected in sub-slab soil vapor within OU2 and beyond the OU2 boundaries. No media-specific remedial alternatives were evaluated; however, the source of the soil vapor impacts (contaminated soil and/or groundwater) will be addressed via the remedy selection process.

Off-site soil vapor intrusion issues identified during the RI were addressed as an IRM, as discussed in Section 6.2. Operation and maintenance of the vapor mitigation systems are being managed under the Operable Unit OU1 Groundwater Plume.

Exhibit B

DESCRIPTION OF REMEDIAL ALTERNATIVES

For each remedial alternative, other than the No Action alternative, the on-site building will be removed prior to implementation of the remedial alternative. The building presents an obstacle to successful implementation of each remedial alternative by inhibiting access to underlying contamination; any plans to access underlying contamination by drilling through the building foundation would require such significant abatement of the dilapidated building for worker safety that it would be more cost effective to simply remove the building. Also, to facilitate the remedial alternatives described below, the surface water stream currently entering the source property will be temporarily re-routed. This will prevent the stream from contacting contamination on site, prevent further contaminant migration, and facilitate implementation of the remedial action. Contaminated soils which are excavated during the creek re-routing construction activities will be disposed off-site. Following successful source area remediation, the creek will be restored to its natural flow path. The estimated cost of building removal and surface water re-routing is included in the capital cost of each remedial alternative.

Alternative 1 – No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative leaves the site in its present condition and does not provide any additional protection to public health and the environment.

Common Element

A presumptive remedy of In-Situ Chemical Treatment will be implemented as a common element, to be implemented in addition to each of the remedial action alternatives described below, to address the most significantly contaminated off-site shallow groundwater and saturated zone soil contamination. This common element of the alternatives is depicted in Figure 16.

Off-Site In-Situ Chemical Oxidation – Common Element

A chemical oxidant will be injected into the subsurface to destroy the contaminants in an approximately 52,000-square feet area (see Figure 16) via injection wells screened from approximately 4 to 25 feet. The byproducts of the ISCO process are non-toxic. It is estimated that approximately 140 injection points will be installed to inject permanganate during two separate events over several months.

Present Worth:.....*$6,480,000*
Capital Cost:.....*$6,270,000*

Annual Costs:……$48,000 (years 1-5)

Action Alternatives

Alternative 2 – Excavation with Off-Site Disposal and In-Situ Chemical Oxidation

All on-site soils from the ground surface to the clay aquitard which exceed unrestricted SCOs, as defined by 6 NYCRR Part 375-6.8, will be excavated and transported off-site for disposal. All immediately adjacent (off-site) soils which exceed unrestricted SCOs for the site contaminants (i.e., PCE, TCE, DCE and VC), as defined by 6NYCRR Part 375-6.8, will be excavated and transported off-site for disposal. Approximately 32,000 cubic yards of soil will be excavated from an area measuring approximately 38,000 square feet (see Figure 7) to a depth of 25 feet. On-site soil which does not exceed SCOs for the use of the site and/or the protection of groundwater may be used to backfill the excavation to the extent that a sufficient volume of on-site soil is available. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil or complete the backfilling of the excavation and establish the designed grades at the site. Alternative 2 is depicted on Figure 12.

In-situ chemical oxidation (ISCO) will be implemented to treat contaminants in deep groundwater. A chemical oxidant will be injected into the subsurface to destroy the contaminants in an approximately 35,500-square feet area (see Figure 10) via injection wells screened from approximately 25 to 40 feet. The byproducts of the ISCO process are non-toxic. It is estimated that approximately 70 deep injection points will be installed to inject permanganate during two separate events over several months

Present Worth:.....$19,900,000
Capital Cost:.....$19,300,000
Annual Costs:……$61,000 (years 1-30)

Alternative 3 – Excavation with On-Site Treatment and In-situ Chemical Oxidation

On-site soils from the ground surface to the clay aquitard which exceed unrestricted use SCOs, and immediately adjacent (off-site) soils which exceed unrestricted SCOs for the site contaminants (i.e., PCE, TCE, DCE and VC), will be excavated and subjected to thermal desorption on-site to remove contaminants from the soil matrix. The soil will be heated, usually to about 900 degrees Celsius, to cause the contaminants to change into vapor form and evaporate from the soil. The vapors will be collected and treated prior to discharge to the atmosphere. Approximately 32,000 cubic yards of soil will be excavated from an area measuring approximately 38,000 square feet to an approximate depth of 25 feet. Following treatment, soil that meets unrestricted use will receive a beneficial use determination and will be reused on-site as backfill material. Alternative 3 is depicted on Figure 12.

ISCO will be implemented to treat contaminants in deep groundwater. A chemical oxidant will be injected into the subsurface to destroy the contaminants in an approximately 35,500-square feet area (see Figure 10) via injection wells screened from approximately 25 to 40 feet. The byproducts of the ISCO process are non-toxic. It is estimated that approximately 70 deep injection points will be installed to inject permanganate during two separate events over several months

Present Worth:.....*$11,800,000*
Capital Cost:.....*$11,200,000*
Annual Costs:.....*$61,000 (years 1-30)*

Alternative 4 – Thermal Treatment

In-Situ Thermal Treatment will be implemented to destroy or volatilize volatile organic compounds (VOCs) in the area indicated on Figure 13 to a depth of approximately 40 feet, to remediate contaminated soil extending to approximately 25 feet deep and contaminated groundwater extending to approximately 40 feet deep. The gases produced by the thermal treatment will be collected by vapor extraction wells and treated in an ex-situ treatment unit. Electrical resistance heating (ERH) will be utilized to perform the treatment. An electrical current will be produced in the treatment area between electrodes installed underground. Heat will be generated as movement of the current meets resistance from the soil. This alternative includes excavation and off-site disposal of site soil from 0-2 feet. Excavation of the surface soil is necessary to accommodate the installation of the vapor collection network, and sampling has demonstrated that significant portions of the surface soil is contaminated with site-related contaminants, thus necessitating off-site disposal at a permitted facility. Alternative 4 is depicted on Figure 13.

Present Worth:.....*$14,000,000*
Capital Cost:.....*$13,800,000*
Annual Costs:.....*$41,000 (years 1-5)*

Alternative 5 – In-situ Chemical Oxidation

ISCO will be implemented to treat contaminants in soil and groundwater. A chemical oxidant will be placed into the subsurface to destroy the contaminants in an approximately 38,000-square feet area (see Figure 9) to a depth of 25 feet by direct mixing of the chemical in the soil with an excavator or auger. The byproducts of the ISCO process are non-toxic.

ISCO will be implemented to treat contaminants in deep groundwater. A chemical oxidant will be injected into the subsurface to destroy the contaminants in an approximately 35,500-square feet area (see Figure 14) via injection wells screened from approximately 25 to 40 feet. The byproducts of the ISCO process are non-toxic. It is estimated that approximately 70 deep injection points will

be installed to inject permanganate during two separate events over several months. Alternative 5 is depicted on Figure 14.

Prior to the full implementation of this technology, a bench-scale treatment study would be conducted to determine the optimum chemical and dosage for treatment.

Present Worth:.....*$8,760,000*
Capital Cost:.....*$8,120,000*
Annual Costs:.....*$61,000 (years 1-30)*

Alternative 6 – Containment

A physical barrier will be installed around the on-site contamination using a vertical barrier (e.g., slurry wall) and impermeable cap (e.g., HDPE, clay or asphalt). The limits of the vertical barrier and cap will cover the majority of the site and some immediately adjacent property, amounting to approximately 37,000 square feet (see Figure 15). The slurry wall will extend at least 2 feet into the confining clay layer located at approximately 20 feet below ground surface. The slurry wall will be constructed using a bentonite and/or cement mixture with the existing native soils. The impermeable cap will be constructed of a 2 feet thick clay layer with 6 inches of top soil and a vegetated top. To reverse a downward hydraulic gradient from the shallow water-bearing unit to the deep water-bearing unit and to prevent horizontal migration of contamination within the deep water-bearing unit, a groundwater extraction system will be required. To capture the contamination that has already migrated to the deep groundwater, extraction wells will be extended below the aquitard. Treated water will be discharged to the constructed drainage swale along the railroad right-of-way. As contamination will remain on-site, an environmental easement will be required to restrict future use of the site and a Site Management Plan will be required. Alternative 6 is depicted on Figure 15.

Present Worth:.....*$5,530,000*
Capital Cost:.....*$2,970,000*
Annual Costs:.....*$166,000 (years 1-30)*

Exhibit C

	Remedial Alternative	**Capital Cost ($)**	**Annual Cost ($)**	**Total Present Worth ($)**
1	No Action	0	0	0
2	Excavation with Off-Site Disposal and In-Situ Chemical Treatment	22,900,000	61,000	23,500,000
3	Excavation with On-Site Treatment and In-Situ Chemical Treatment	13,200,000	61,000	13,900,000
4	Thermal Treatment	13,800,000	41,000	14,000,000
5	In-Situ Chemical Treatment	10,200,000	61,000	10,900,000
6	Containment	2,950,000	166,000	5,510,000
CE	Off-Site In-Situ Chemical Oxidation/Reduction Injections	6,270,000	48,000	6,480,000

NOTE: Cost estimates for Alternatives 2-6 above include the common work elements of removal of on-site structures, excavation of top 2 feet of soil, and re-routing of surface water.

Exhibit D

SUMMARY OF THE PROPOSED REMEDY

The Department is proposing Alternative 4, Excavation and Thermal Treatment With In-situ Chemical Treatment as the remedy for OU 02 Source Area. Alternative 4 would achieve the remediation goals for OU 02 by thermally treating the subsurface soils and groundwater down to 40 feet below grade to volatilize the VOCs. The VOCs will then be captured through vapor extraction and treated prior to release to the atmosphere. The elements of this remedy are described in Section 7. The proposed remedy is depicted on Figures 13 and 16.

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 Alternative 4 would satisfy this criterion by removing the contamination from both the soil and groundwater from the interval of 0 to 40 feet below grade. Alternative 1 (No Action) does not provide any protection to public health and the environment and will not be evaluated further. Alternatives 2 and 3, by removing all soil contaminated above the unrestricted use soil cleanup objectives, meet the threshold criteria. Alternatives 4 and 5 also comply with this criterion but to a lesser degree or with lower certainty. Alternatives 2, 3, 5 and 6 rely on a restriction of groundwater use at the site to protect human health. Alternative 4 will require a short-term restriction on groundwater use. The potential for soil vapor intrusion will be significantly reduced by Alternatives 2, 3, 4 and 5 and to a somewhat lesser extent by Alternative 6.

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

Alternative 4 complies with SCGs to the extent practicable. It addresses source areas of contamination and complies with the unrestricted use soil cleanup objectives at the surface through the removal of the top 2 feet of soil and thermally treating the soil below 2 feet down to a depth of 40 feet. It also creates the conditions necessary to restore groundwater quality to the extent

practicable. Alternatives 2, 3, 5 and 6 also comply with this criterion but to a lesser degree or with lower certainty. Because Alternatives 2, 3, 4, 5 and 6 satisfy the threshold criteria, the remaining criteria are particularly important in selecting a final remedy for OU 02. It is expected Alternative 4 will achieve groundwater SCGs in less than 5 years, while groundwater contamination above SCGs will remain on-site under Alternatives 2, 3, 5 and 6 for many years.

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 within OU 02 after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Alternatives 2, 3, 4, 5 and 6 would all be designed to be an effective long term solution to the soil contamination. Alternative 2, 3, 4 and 5 physically remove or treat the contamination from the site, with Alternative 2 providing the highest long-term effectiveness since all contaminated soil would be removed from the site. Alternatives 3 and 4 would provide the next highest effectiveness since these soils would be treated with a higher degree of certainty rather than Alternative 5, where effectiveness is directly related to the ability to have the chemical oxidant or reducing agent in direct contact with the contamination. Alternative 6 leaves the main source area of contamination in place and relies on a low permeability slurry wall and pumping system to contain the contamination on-site. In the event the pumping system is no longer operational, contamination could migrate beyond the site. Alternatives 2, 3, 4, 5 and 6 would reduce the potential for soil vapor intrusion, with Alternatives 2, 3, 4 and 5 providing the most confidence the pathway would be removed since a majority of the contaminant mass will be removed.

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 for OU 02.

Alternatives 2, 3, 4 and 5 physically remove or treat the contamination from the site, thus reducing the volume, mobility and toxicity at the site. Alternative 2 would result in no reduction in contamination, only relocation of contamination to a secure landfill. Alternative 3 would require treatment of soil on-site and the contamination would be transferred to the vapor phase where it would be treated. Alternative 4 would destroy most of the contamination through oxidation or transfer it to the vapor phase where it would be treated. Alternative 5 would chemically treat the contamination, though the effectiveness would be directly linked to the ability to get the chemical oxidant or reducing agent in contact with the contamination. Alternative 6 leaves the main source area of contamination in place and relies on a low permeability slurry wall and pumping system to contain the contamination on-site. In the event the pumping system is no longer operational or a breach in the slurry wall occurs, contamination could migrate beyond the treatment zone.

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

Alternatives 2 through 6 all have short-term impacts which could be controlled through engineering solutions; however, Alternative 4 would have the least impact. Alternative 2 would have the greatest impact due to the large number of truck trips needed to remove the contaminated soil and bring in clean fill. The duration of on-site construction activities ranging from shortest to longest is: Alternative 4, 6, 2, 5 and 3. The time needed to achieve the remediation goals is the shortest for Alternative 4 and longer for Alternative 2, 3, 5 and 6 given the potential for groundwater impacts to exist after the remedies have been implemented.

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

Alternatives 2, 3, 4, 5 and 6 are favorable in that they are implementable, though each will have administrative or technical requirements. Alternative 2 will require the handling, transporting and disposing of hazardous waste to permitted facilities. Alternative 3 will require the construction of a temporary structure to handle the vapors emitted during the treatment of the excavated soils; workers would also require more stringent personal protective equipment for working in the structure. Alternatives 4 and 5 have limited number of contractors who can do thermal treatment and in-situ chemical treatment auger mixing, which could affect the procurement process. Alternative 6 requires that the remedy will require contamination to be left in place, which may require more difficulty in getting an environmental easement in place.

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.

Costs estimates for Alternatives 2, 3, 4 and 5 are within 30% of each other, which is within the margin of error (-20%/+50%) typically applied to these estimates. The present worth costs of these alternatives can be ranked in the following order: Alternative 3, 4, 5 and 2. Alternative 6 is significantly less; however, this alternative leaves a majority of contamination in place. Alternative 2 requires the disposal of hazardous waste soils at a permitted facility and the costs will be highly dependent of the volume of soil being classified as hazardous waste. Alternative 3 will require the handling and treatment of the soil within a temporary structure with air handling capabilities, which will affect costs. The cost of implementing Alternative 4 is better defined since the volume

and mass of contaminated materials are better defined. The cost associated with Alternative 5 is dependent on the natural oxidant demand, which can be determined through bench scale testing.

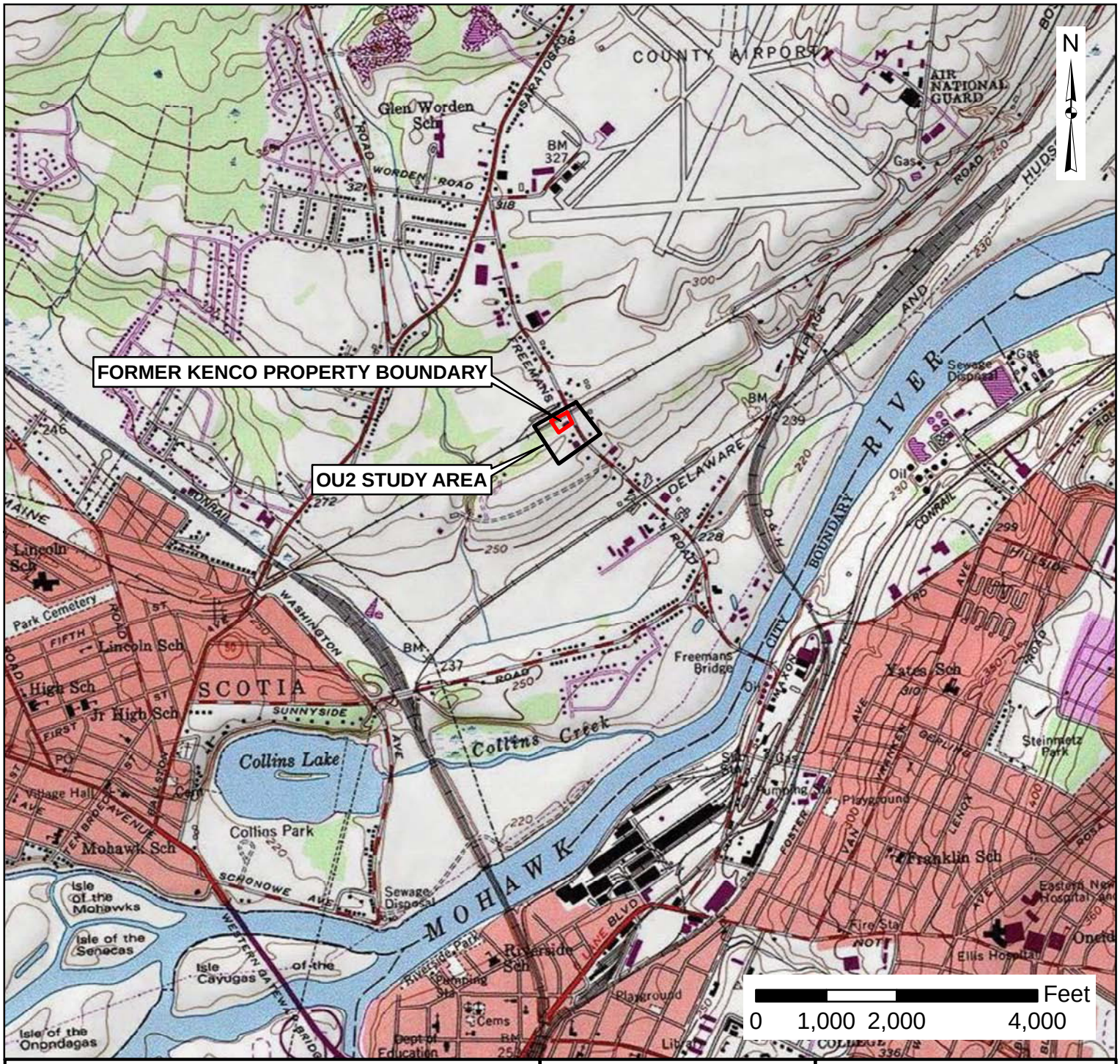
8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

Alternatives 2, 3, 4 and 5 will not likely inhibit current or intended future use of the site. Alternative 6 may limit future use of the site with maintaining a soil cap and also having a treatment system located on the property. Alternatives 2, 3 and 4 and possibly 5 will provide the most likely chance of meeting the unrestricted soil cleanup objectives and thus limit any soil restrictions. Alternative 4 will have the most likely success of meeting the ambient groundwater standards, with Alternatives 2, 3 and 5, providing slightly less treatment efficacy. Alternative 6 will likely not meet soil or groundwater standards within 30 years.

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.

Alternative 4 Thermal Treatment is being proposed because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.



Source: ArcGIS Topographic Map

AECOM
40 British American Blvd.
Latham, NY 12110
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F: (518) 951-2300

FIGURE 1

SITE LOCATION MAP

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015

60279942

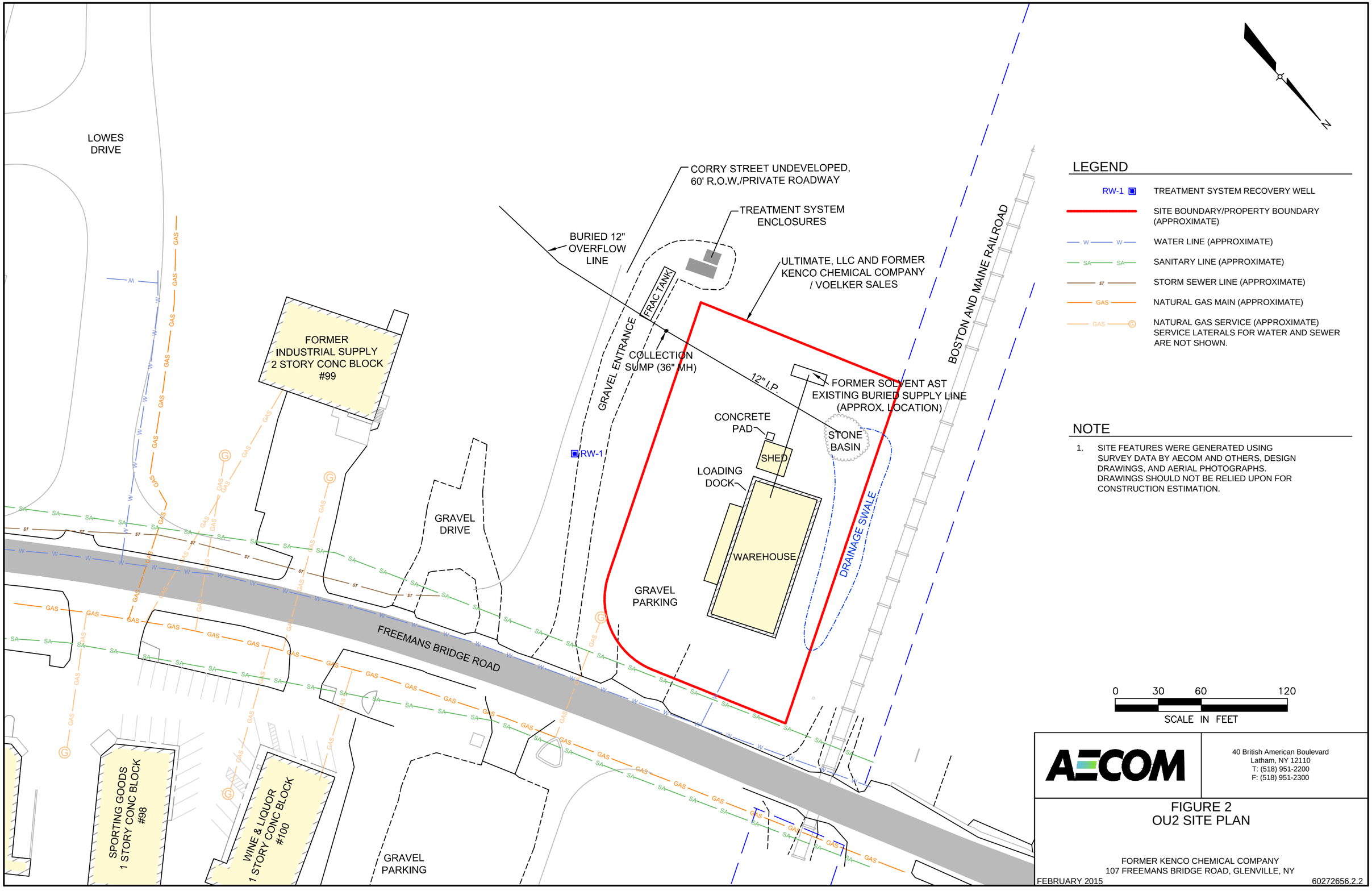

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FIGURE 2
OU2 SITE PLAN

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2

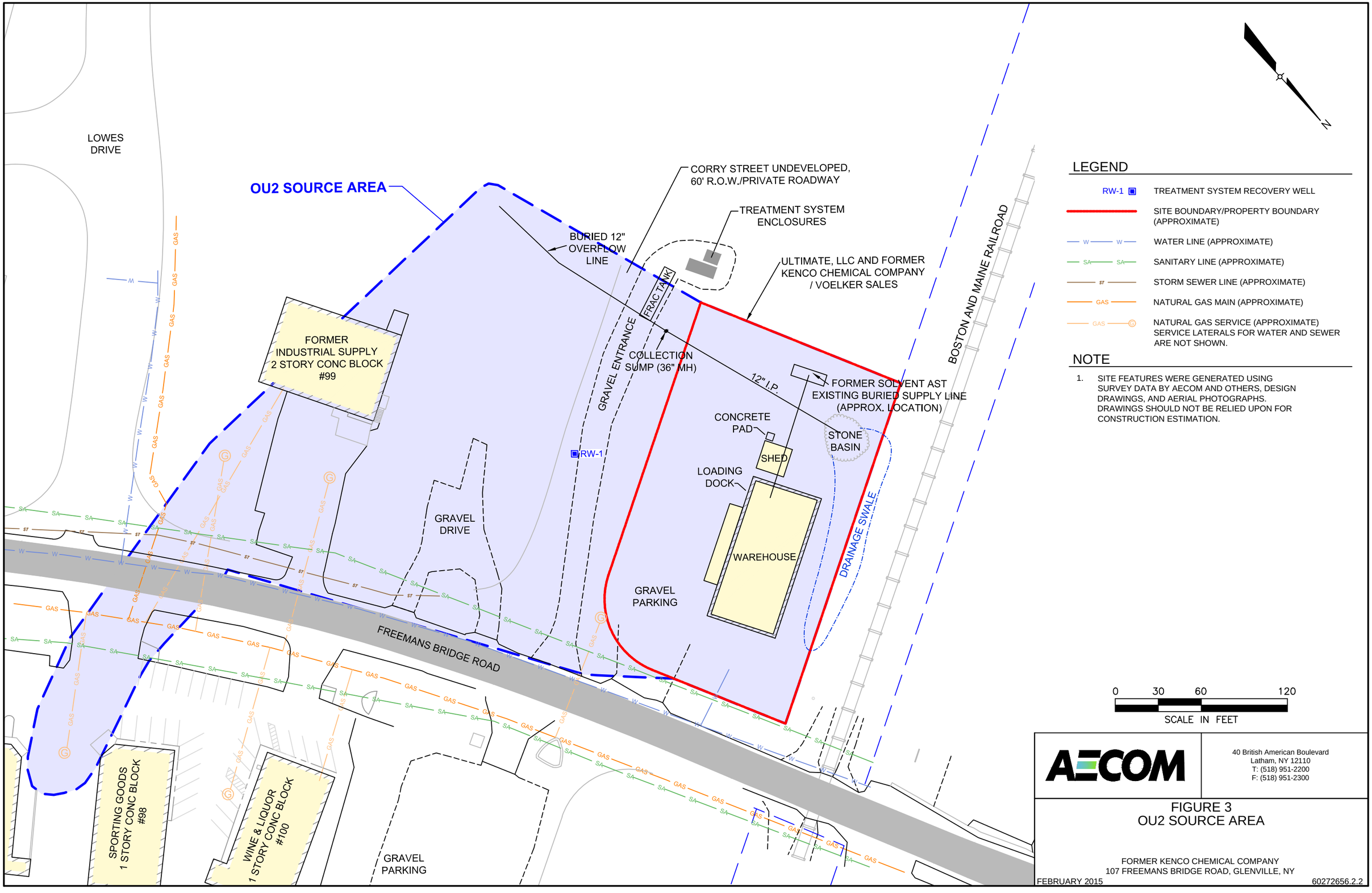

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FIGURE 3
OU2 SOURCE AREA

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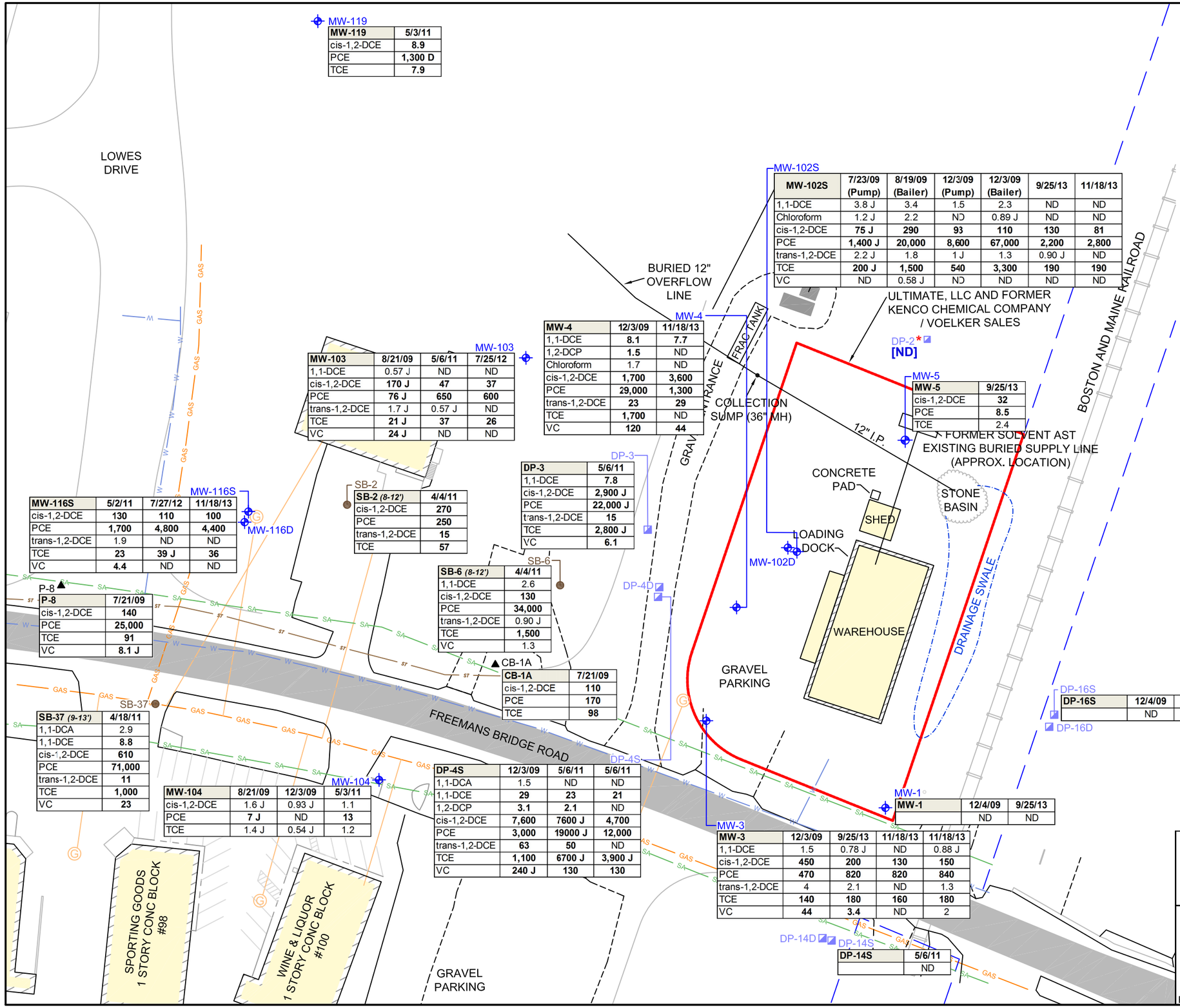

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FIGURE 4
VOC EXCEEDANCES IN GROUNDWATER SHALLOW WATER BEARING ZONE (OU2)

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2

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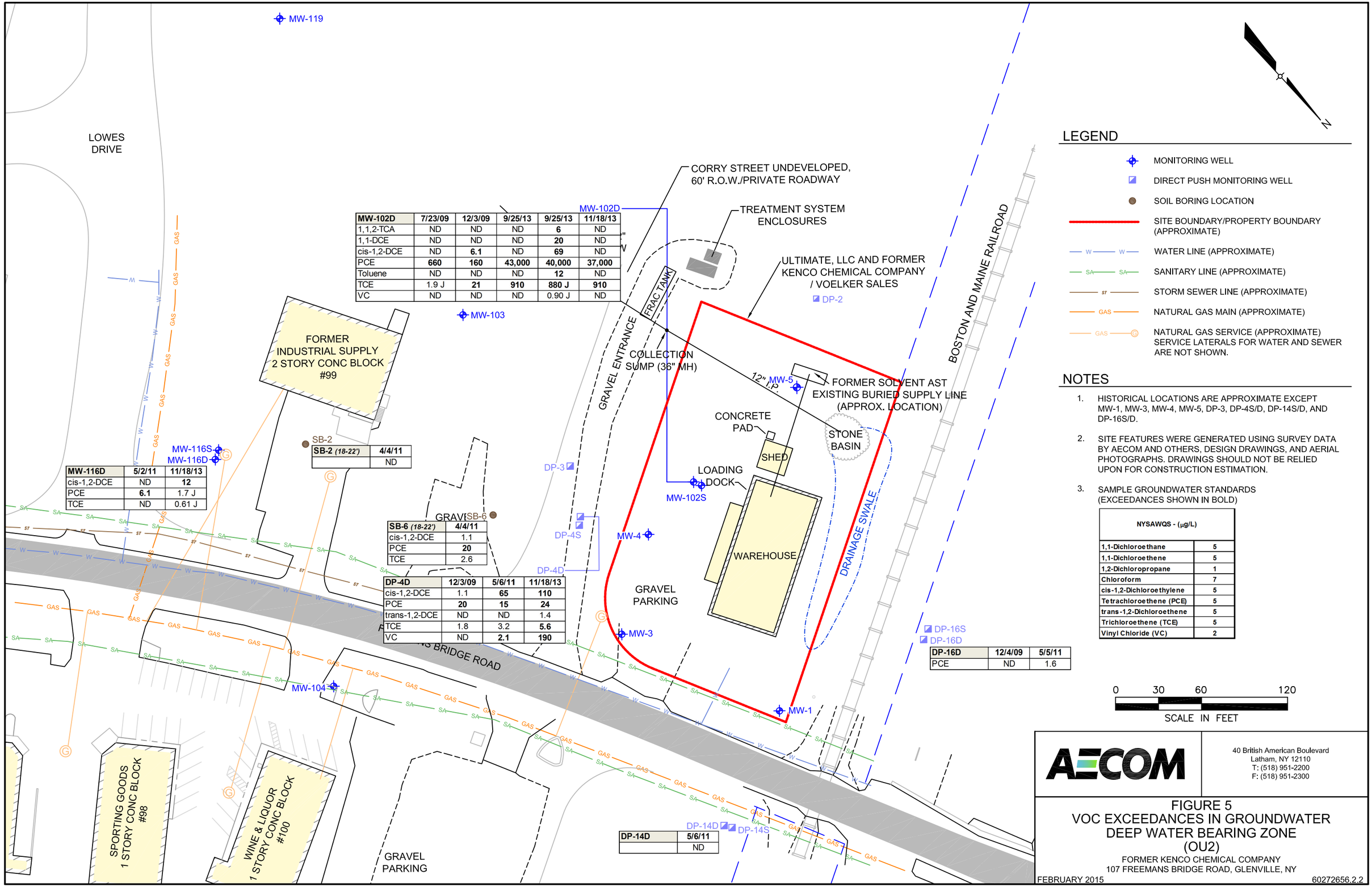

MW-102D	7/23/09	12/3/09	9/25/13	9/25/13	11/18/13
1,1,2-TCA	ND	ND	ND	**6**	ND
1,1-DCE	ND	ND	ND	**20**	ND
cis-1,2-DCE	ND	**6.1**	ND	**69**	ND
PCE	**660**	**160**	**43,000**	**40,000**	**37,000**
Toluene	ND	ND	ND	**12**	ND
TCE	1.9 J	**21**	**910**	**880 J**	**910**
VC	ND	ND	ND	0.90 J	ND

MW-116D	5/2/11	11/18/13
cis-1,2-DCE	ND	**12**
PCE	**6.1**	1.7 J
TCE	ND	0.61 J

SB-2 *(18-22')*	4/4/11
	ND

SB-6 *(18-22')*	4/4/11
cis-1,2-DCE	1.1
PCE	**20**
TCE	2.6

DP-4D	12/3/09	5/6/11	11/18/13
cis-1,2-DCE	1.1	**65**	**110**
PCE	**20**	**15**	**24**
trans-1,2-DCE	ND	ND	1.4
TCE	1.8	3.2	**5.6**
VC	ND	**2.1**	**190**

DP-16D	12/4/09	5/5/11
PCE	ND	1.6

DP-14D	5/6/11
	ND

NYSAWQS - (µg/L)	
1,1-Dichloroethane	5
1,1-Dichloroethene	5
1,2-Dichloropropane	1
Chloroform	7
cis-1,2-Dichloroethylene	5
Tetrachloroethene (PCE)	5
trans-1,2-Dichloroethene	5
Trichloroethene (TCE)	5
Vinyl Chloride (VC)	2

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FIGURE 5
VOC EXCEEDANCES IN GROUNDWATER DEEP WATER BEARING ZONE (OU2)

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2

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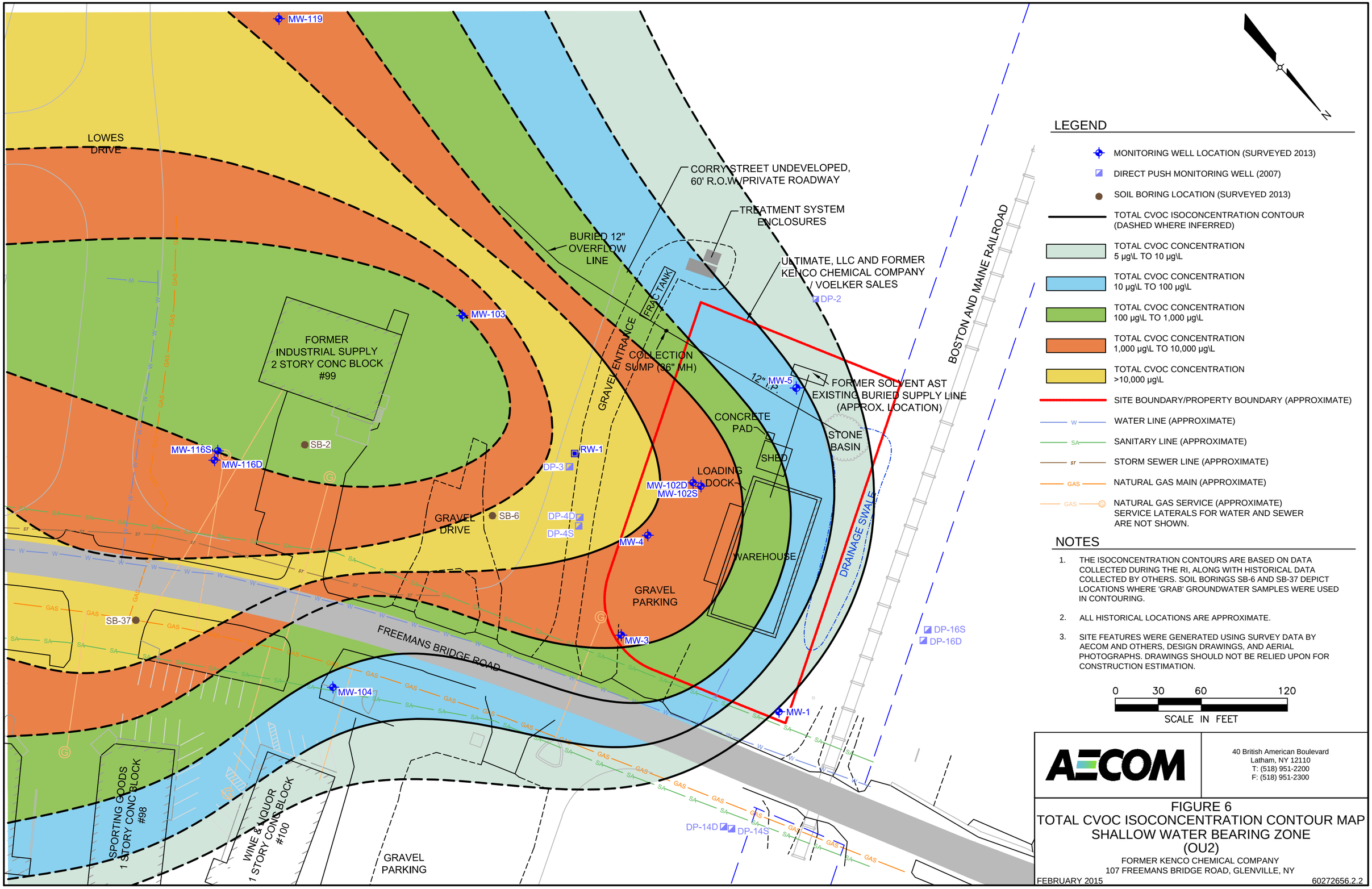

NOTES

1. THE ISOCONCENTRATION CONTOURS ARE BASED ON DATA COLLECTED DURING THE RI, ALONG WITH HISTORICAL DATA COLLECTED BY OTHERS. SOIL BORINGS SB-6 AND SB-37 DEPICT LOCATIONS WHERE 'GRAB' GROUNDWATER SAMPLES WERE USED IN CONTOURING.
2. ALL HISTORICAL LOCATIONS ARE APPROXIMATE.
3. SITE FEATURES WERE GENERATED USING SURVEY DATA BY AECOM AND OTHERS, DESIGN DRAWINGS, AND AERIAL PHOTOGRAPHS. DRAWINGS SHOULD NOT BE RELIED UPON FOR CONSTRUCTION ESTIMATION.

0 30 60 120

SCALE IN FEET

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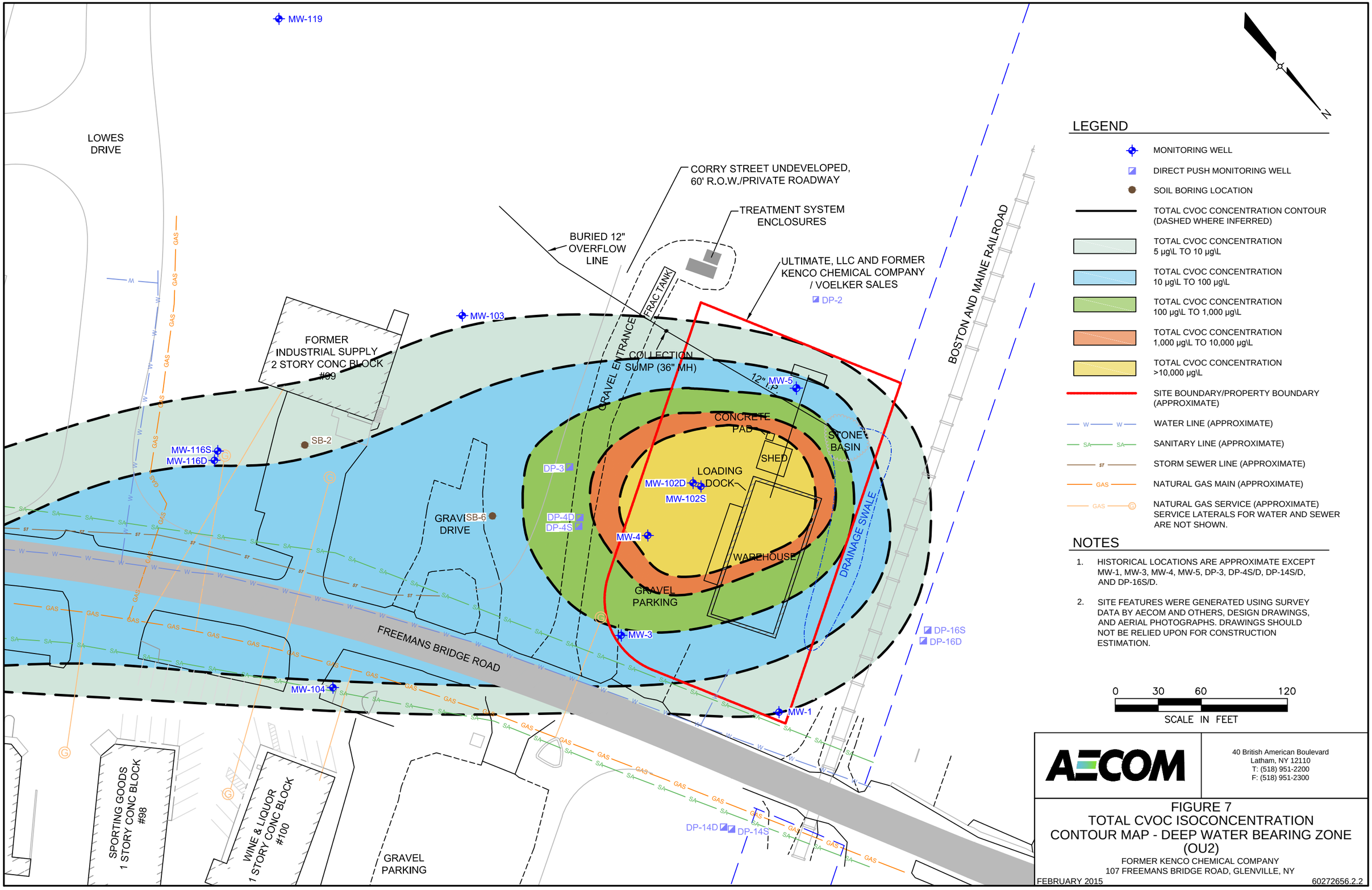
FIGURE 6
TOTAL CVOC ISOCONCENTRATION CONTOUR MAP SHALLOW WATER BEARING ZONE (OU2)

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2



LEGEND

- MONITORING WELL
- DIRECT PUSH MONITORING WELL
- SOIL BORING LOCATION
- TOTAL CVOC CONCENTRATION CONTOUR (DASHED WHERE INFERRED)
- TOTAL CVOC CONCENTRATION 5 µg\L TO 10 µg\L
- TOTAL CVOC CONCENTRATION 10 µg\L TO 100 µg\L
- TOTAL CVOC CONCENTRATION 100 µg\L TO 1,000 µg\L
- TOTAL CVOC CONCENTRATION 1,000 µg\L TO 10,000 µg\L
- TOTAL CVOC CONCENTRATION >10,000 µg\L
- SITE BOUNDARY/PROPERTY BOUNDARY (APPROXIMATE)
- WATER LINE (APPROXIMATE)
- SANITARY LINE (APPROXIMATE)
- STORM SEWER LINE (APPROXIMATE)
- NATURAL GAS MAIN (APPROXIMATE)
- NATURAL GAS SERVICE (APPROXIMATE) SERVICE LATERALS FOR WATER AND SEWER ARE NOT SHOWN.

NOTES

1. HISTORICAL LOCATIONS ARE APPROXIMATE EXCEPT MW-1, MW-3, MW-4, MW-5, DP-3, DP-4S/D, DP-14S/D, AND DP-16S/D.
2. SITE FEATURES WERE GENERATED USING SURVEY DATA BY AECOM AND OTHERS, DESIGN DRAWINGS, AND AERIAL PHOTOGRAPHS. DRAWINGS SHOULD NOT BE RELIED UPON FOR CONSTRUCTION ESTIMATION.

0 30 60 120

SCALE IN FEET

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FIGURE 7
TOTAL CVOC ISOCONCENTRATION CONTOUR MAP - DEEP WATER BEARING ZONE (OU2)

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2

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LOWES DRIVE

SS-107	5/25/11
	ND

SS-107

SED-106

SED-106	5/25/11
cis-1,2-DCE	0.0049 J
PCE	0.0058 J

SG-5-09

SG-5	9/30/09
cis-1,2-DCE	0.18 J
PCE	**1.7**
TCE	0.15 J

SS-108

SS-108	5/25/11
	ND

CORRY STREET UNDEVELOPED, 60' R.O.W./PRIVATE ROADWAY

TREATMENT SYSTEM ENCLOSURES

BURIED OVERFLOW LINE

ULTIMATE, LLC AND FORMER KENCO CHEMICAL COMPANY / VOELKER SALES

FRAC TANK

GRAVEL ENTRANCE

COLLECTION SUMP (36" MH)

12" I.P.

BOSTON AND MAINE RAILROAD

FORMER SOLVENT AST EXISTING BURIED SUPPLY LINE (APPROX. LOCATION)

SS-06

SS-06	9/26/13
	ND

FORMER INDUSTRIAL SUPPLY 2 STORY CONC BLOCK #99

SS-08

SS-08	9/26/13
cis-1,2-DCE	0.0033 J
PCE	0.0029 J

CONCRETE PAD

SHED

STONE BASIN

SS-04

SS-04	9/26/13
PCE	0.01

SS-07

SS-07	9/26/13
PCE	0.0036 J

SS-03

SS-03	9/26/13
PCE	0.027

SS-05

SS-05	9/26/13
PCE	0.018

GRAVEL DRIVE

WAREHOUSE

DRAINAGE SWALE

SS-01

SS-01	9/26/13
	ND

GRAVEL PARKING

FREEMANS BRIDGE ROAD

SS-02

SS-02	9/26/13
	ND

SPORTING GOODS 1 STORY CONC BLOCK #98

WINE & LIQUOR 1 STORY CONC BLOCK #100

GRAVEL PARKING

N

LEGEND

- SED-106 / SS-06 / SG-5-09 — SURFACE SOIL LOCATIONS
- SITE BOUNDARY/PROPERTY BOUNDARY (APPROXIMATE)
- W — WATER LINE (APPROXIMATE)
- SA — SANITARY LINE (APPROXIMATE)
- ST — STORM SEWER LINE (APPROXIMATE)
- GAS — NATURAL GAS MAIN (APPROXIMATE)
- GAS — G — NATURAL GAS SERVICE (APPROXIMATE) SERVICE LATERALS FOR WATER AND SEWER ARE NOT SHOWN.

NOTES

1. SITE FEATURES WERE GENERATED USING SURVEY DATA BY AECOM AND OTHERS, DESIGN DRAWINGS, AND AERIAL PHOTOGRAPHS. DRAWINGS SHOULD NOT BE RELIED UPON FOR CONSTRUCTION ESTIMATION.
2. SURFACE SOIL ANALYTICAL STANDARDS

EXCEEDANCES SHOWN IN BOLD FOR THE SITE CONTAMINANTS OF CONCERN

NYSDEC 375-6 UNRESTRICTED USE SOIL CLEANUP OBJECTIVES (mg/kg)	
cis-1,2-Dichloroethene	0.25
Tetrachloroethene (PCE)	1.3
Trichloroethene (TCE)	0.47

0 30 60 120

SCALE IN FEET

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FIGURE 8
SURFACE SOIL ANALYTICAL DATA 2009 - 2013 (OU2)

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2

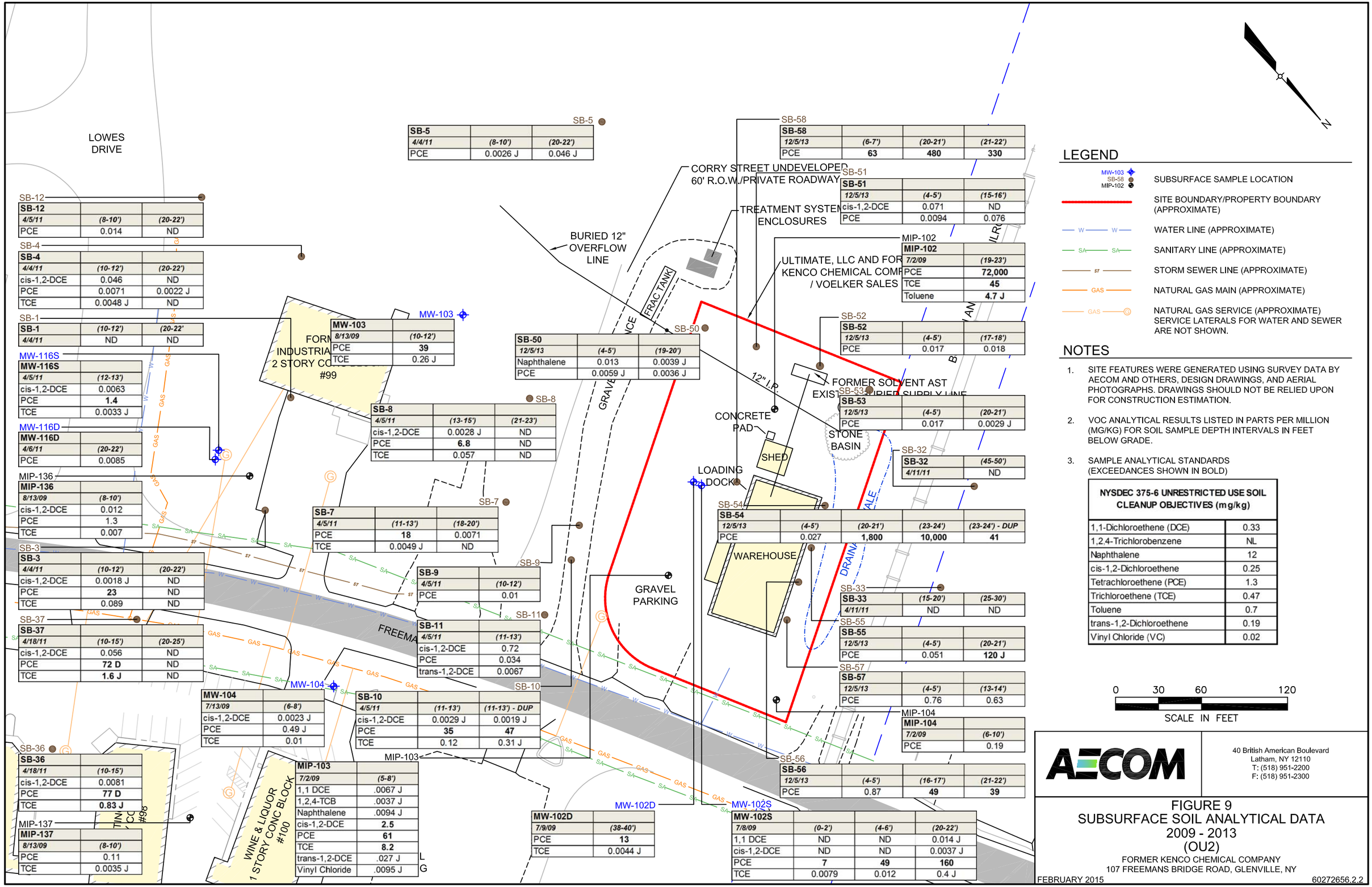

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FIGURE 9
SUBSURFACE SOIL ANALYTICAL DATA 2009 - 2013 (OU2)

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2

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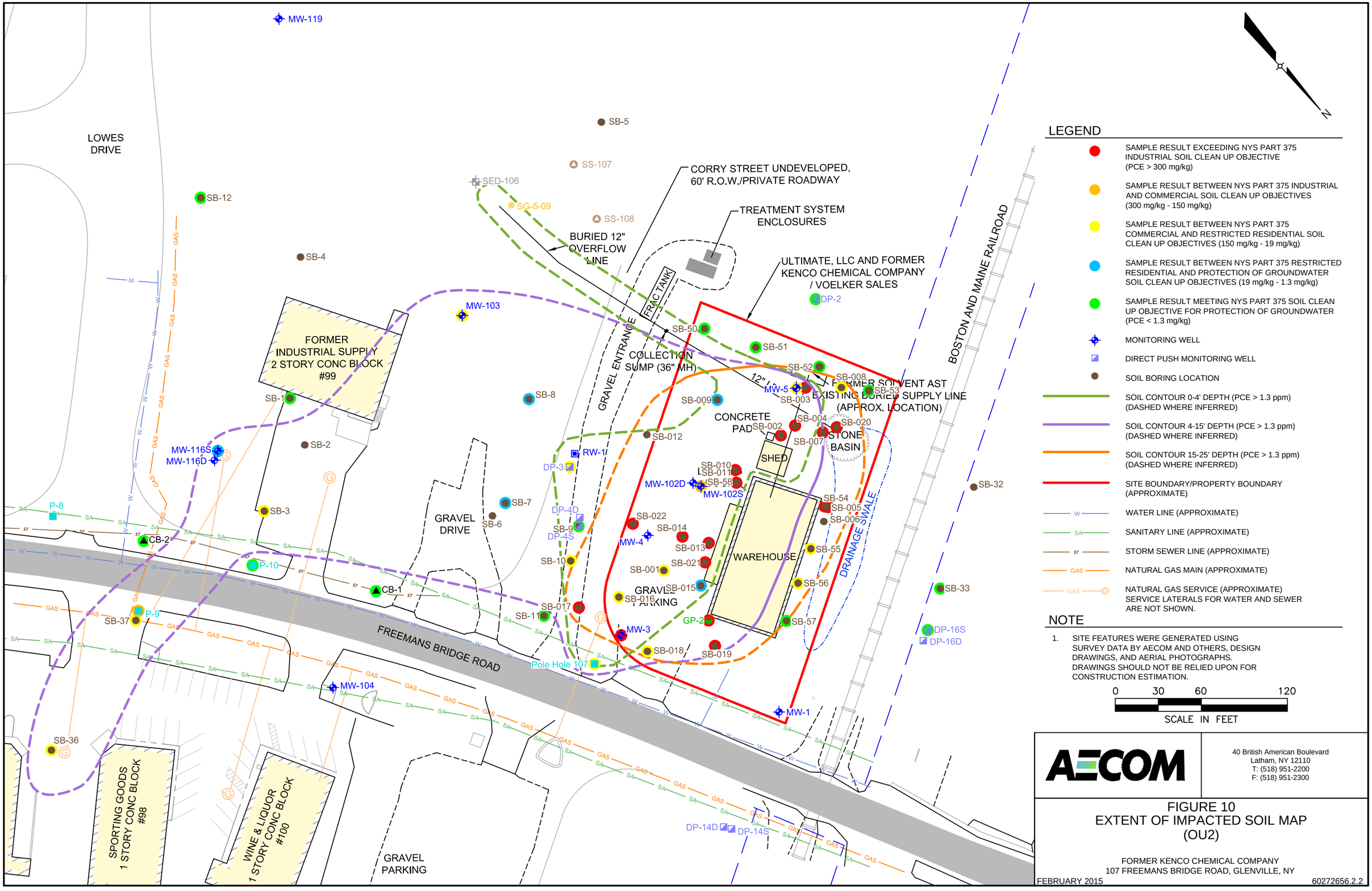

LEGEND

- SAMPLE RESULT EXCEEDING NYS PART 375 INDUSTRIAL SOIL CLEAN UP OBJECTIVE (PCE > 300 mg/kg)
- SAMPLE RESULT BETWEEN NYS PART 375 INDUSTRIAL AND COMMERCIAL SOIL CLEAN UP OBJECTIVES (300 mg/kg - 150 mg/kg)
- SAMPLE RESULT BETWEEN NYS PART 375 COMMERCIAL AND RESTRICTED RESIDENTIAL SOIL CLEAN UP OBJECTIVES (150 mg/kg - 19 mg/kg)
- SAMPLE RESULT BETWEEN NYS PART 375 RESTRICTED RESIDENTIAL AND PROTECTION OF GROUNDWATER SOIL CLEAN UP OBJECTIVES (19 mg/kg - 1.3 mg/kg)
- SAMPLE RESULT MEETING NYS PART 375 SOIL CLEAN UP OBJECTIVE FOR PROTECTION OF GROUNDWATER (PCE < 1.3 mg/kg)
- MONITORING WELL
- DIRECT PUSH MONITORING WELL
- SOIL BORING LOCATION
- SOIL CONTOUR 0-4' DEPTH (PCE > 1.3 ppm) (DASHED WHERE INFERRED)
- SOIL CONTOUR 4-15' DEPTH (PCE > 1.3 ppm) (DASHED WHERE INFERRED)
- SOIL CONTOUR 15-25' DEPTH (PCE > 1.3 ppm) (DASHED WHERE INFERRED)
- SITE BOUNDARY/PROPERTY BOUNDARY (APPROXIMATE)
- WATER LINE (APPROXIMATE)
- SANITARY LINE (APPROXIMATE)
- STORM SEWER LINE (APPROXIMATE)
- NATURAL GAS MAIN (APPROXIMATE)
- NATURAL GAS SERVICE (APPROXIMATE) SERVICE LATERALS FOR WATER AND SEWER ARE NOT SHOWN.

NOTE

1. SITE FEATURES WERE GENERATED USING SURVEY DATA BY AECOM AND OTHERS, DESIGN DRAWINGS, AND AERIAL PHOTOGRAPHS. DRAWINGS SHOULD NOT BE RELIED UPON FOR CONSTRUCTION ESTIMATION.

0 30 60 120

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FIGURE 10
EXTENT OF IMPACTED SOIL MAP (OU2)

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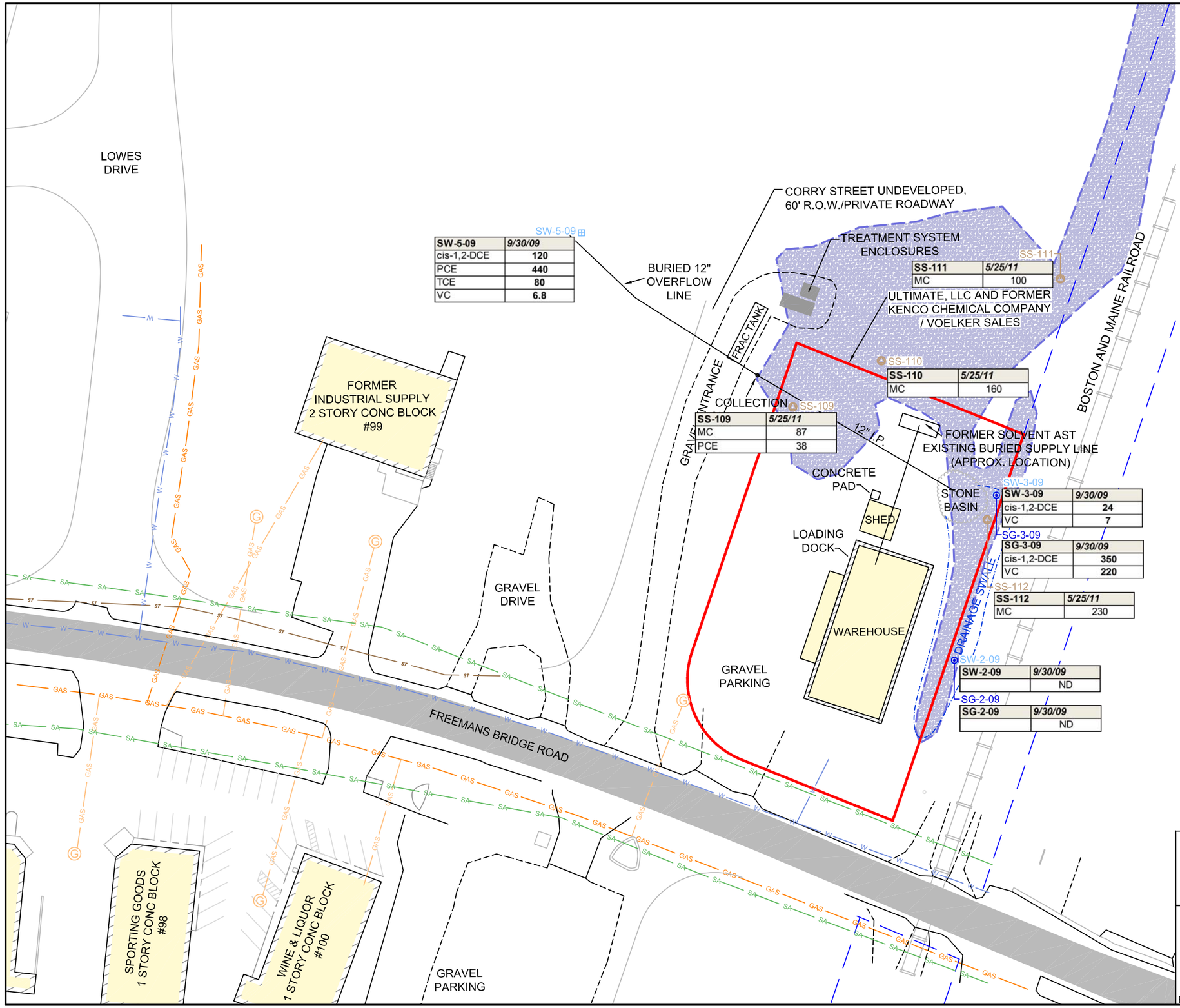
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2



LEGEND

- SURFACE WATER SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION
- SURFACE WATER / SEDIMENT SAMPLE LOCATION
- "WF-2" WETLAND BOUNDARY (APPROXIMATE)
- SITE BOUNDARY/PROPERTY BOUNDARY (APPROXIMATE)
- W — WATER LINE (APPROXIMATE)
- SA — SANITARY LINE (APPROXIMATE)
- ST — STORM SEWER LINE (APPROXIMATE)
- GAS — NATURAL GAS MAIN (APPROXIMATE)
- GAS — G — NATURAL GAS SERVICE (APPROXIMATE) SERVICE LATERALS FOR WATER AND SEWER ARE NOT SHOWN.

NOTES

1. SITE FEATURES WERE GENERATED USING SURVEY DATA BY AECOM AND OTHERS, DESIGN DRAWINGS, AND AERIAL PHOTOGRAPHS. DRAWINGS SHOULD NOT BE RELIED UPON FOR CONSTRUCTION ESTIMATION.
2. SURFACE WATER ANALYTICAL STANDARDS EXCEEDANCES SHOWN IN BOLD

	NYSAWQS - Surface Water (µg/L)
cis-1,2-Dichloroethene	5
Tetrachloroethene	0.7
Trichloroethene	5
Vinyl Chloride	0.3

3. SEDIMENT ANALYTICAL STANDARDS EXCEEDANCES SHOWN IN BOLD

	Sediment Criteria	
	TOC-Normalized SGV (µg/g OC)	Freshwater SGV Class A (µg/Kg dw)
cis-1,2-Dichloroethene (DCE)	39.8	800.00
Methylene Chloride (MC)	NL	NL
Tetrachloroethene (PCE)	814.1	16,000
Vinyl Chloride (VC)	27.75	560.00

0 30 60 120

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FIGURE 11
SURFACE WATER AND SEDIMENT ANALYTICAL RESULTS (OU2)

FORMER KENCO CHEMICAL COMPANY
107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2

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LOWES DRIVE

FORMER INDUSTRIAL SUPPLY 2 STORY CONC BLOCK #99

CORRY STREET UNDEVELOPED, 60' R.O.W./PRIVATE ROADWAY

TREATMENT SYSTEM ENCLOSURES

BURIED 12" OVERFLOW LINE

FRAC TANK

ULTIMATE, LLC AND FORMER KENCO CHEMICAL COMPANY / VOELKER SALES

GRAVEL ENTRANCE

COLLECTION SUMP (36" MH)

12" I.P

FORMER SOLVENT AST EXISTING BURIED SUPPLY LINE (APPROX. LOCATION)

CONCRETE PAD

STONE BASIN

SHED

LOADING DOCK

WAREHOUSE

GRAVEL PARKING

DRAINAGE SWALE

BOSTON AND MAINE RAILROAD

GRAVEL DRIVE

FREEMANS BRIDGE ROAD

SPORTING GOODS 1 STORY CONC BLOCK #98

WINE & LIQUOR 1 STORY CONC BLOCK #100

GRAVEL PARKING

N

LEGEND

- LIMITS OF EXCAVATION
- TOTAL CVOC CONCENTRATION >100 µg/L
- SHORING
- SOIL CONTOUR 15-25' DEPTH (PCE > 1.3 ppm) (DASHED WHERE INFERRED)
- PROPERTY BOUNDARY (APPROXIMATE)
- W — WATER LINE (APPROXIMATE)
- SA — SANITARY LINE (APPROXIMATE)
- ST — STORM SEWER LINE (APPROXIMATE)
- GAS — NATURAL GAS MAIN (APPROXIMATE)
- GAS — G — NATURAL GAS SERVICE (APPROXIMATE) SERVICE LATERALS FOR WATER AND SEWER ARE NOT SHOWN.
- IN SITU CHEMICAL TREATMENT INJECTION POINT (25-40')

0 30 60 120

SCALE IN FEET

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FIGURE 12
ALTERNATIVES 2 AND 3 - EXCAVATION (2-25') AND ISCO (25-40') (OU2)

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107 FREEMANS BRIDGE ROAD, GLENVILLE, NY

FEBRUARY 2015 60272656.2.2

LOWES DRIVE

FORMER INDUSTRIAL SUPPLY 2 STORY CONC BLOCK #99

CORRY STREET UNDEVELOPED, 60' R.O.W./PRIVATE ROADWAY

TREATMENT SYSTEM ENCLOSURES

BURIED 12" OVERFLOW LINE

FRAC TANK

ULTIMATE, LLC AND FORMER KENCO CHEMICAL COMPANY / VOELKER SALES

GRAVEL ENTRANCE

COLLECTION SUMP (36" MH)

12" LP

FORMER SOLVENT AST

EXISTING BURIED SUPPLY LINE (APPROX. LOCATION)

CONCRETE PAD

STONE BASIN

SHED

LOADING DOCK

WAREHOUSE

GRAVEL PARKING

DRAINAGE SWALE

BOSTON AND MAINE RAILROAD

GRAVEL DRIVE

FREEMANS BRIDGE ROAD

SPORTING GOODS 1 STORY CONC BLOCK #98

WINE & LIQUOR 1 STORY CONC BLOCK #100

GRAVEL PARKING

N

LEGEND

- SOIL CONTOUR 15-25' DEPTH (PCE > 1.3 ppm) (DASHED WHERE INFERRED)
- TOTAL CVOC CONCENTRATION >100 µg/L
- PROPERTY BOUNDARY (APPROXIMATE)
- W — WATER LINE (APPROXIMATE)
- SA — SANITARY LINE (APPROXIMATE)
- ST — STORM SEWER LINE (APPROXIMATE)
- GAS — NATURAL GAS MAIN (APPROXIMATE)
- GAS — G — NATURAL GAS SERVICE (APPROXIMATE) SERVICE LATERALS FOR WATER AND SEWER ARE NOT SHOWN.
- THERMAL HEATING ELEMENT (ASSUMED RADIUS OF INFLUENCE OF 18')
- TREATMENT SYSTEM FOR THERMAL HEATING SYSTEM

NOTE

1. LOCATION OF THE THERMAL HEATING SYSTEM SHOWN ONLY FOR DISPLAY PURPOSES ONLY.

0 30 60 120

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FIGURE 13
ALTERNATIVE 4 - THERMAL TREATMENT (2-40') (OU2)

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FEBRUARY 2015 60272656.2.2

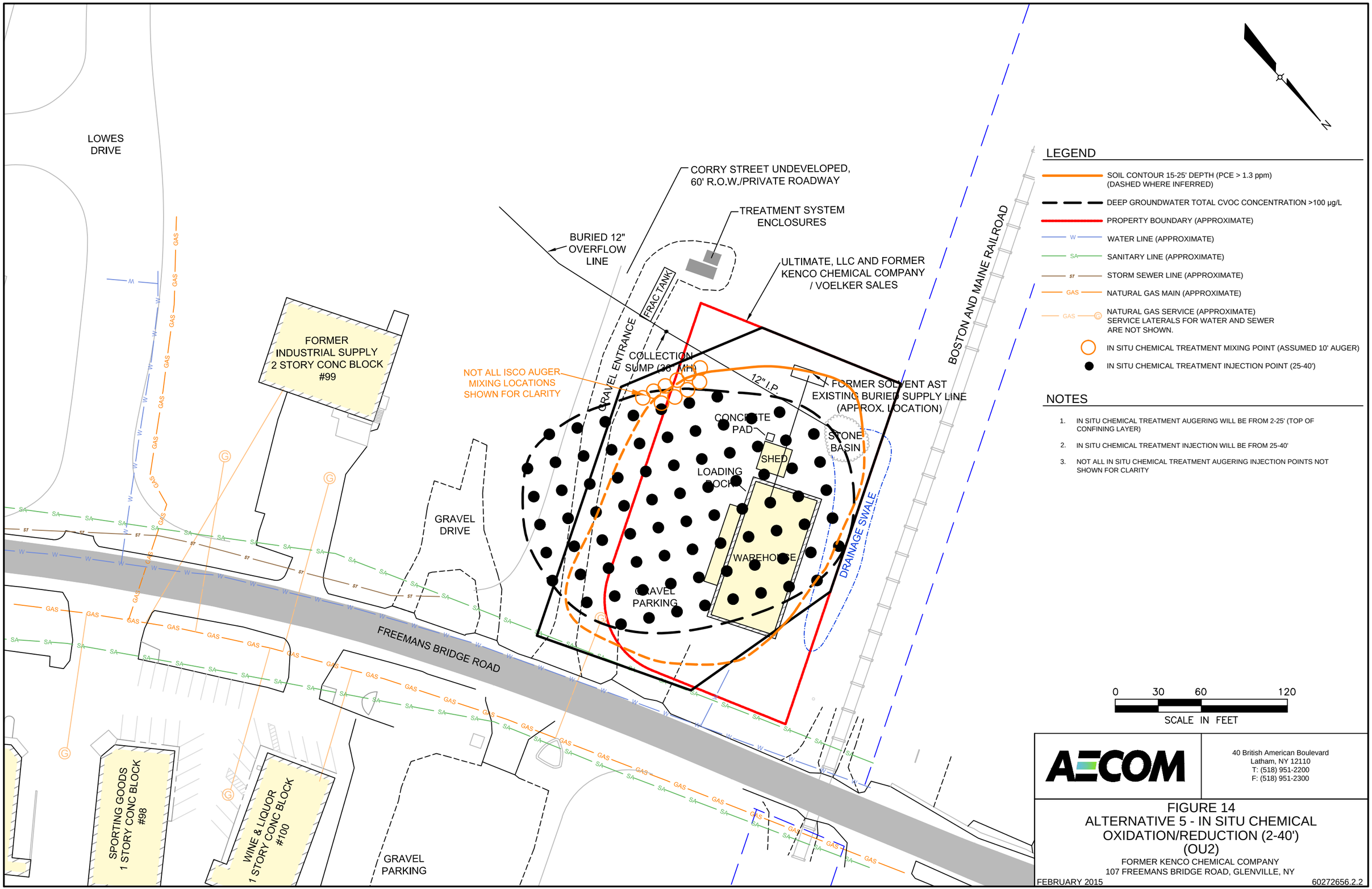

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FIGURE 14
ALTERNATIVE 5 - IN SITU CHEMICAL OXIDATION/REDUCTION (2-40') (OU2)

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FEBRUARY 2015 60272656.2.2

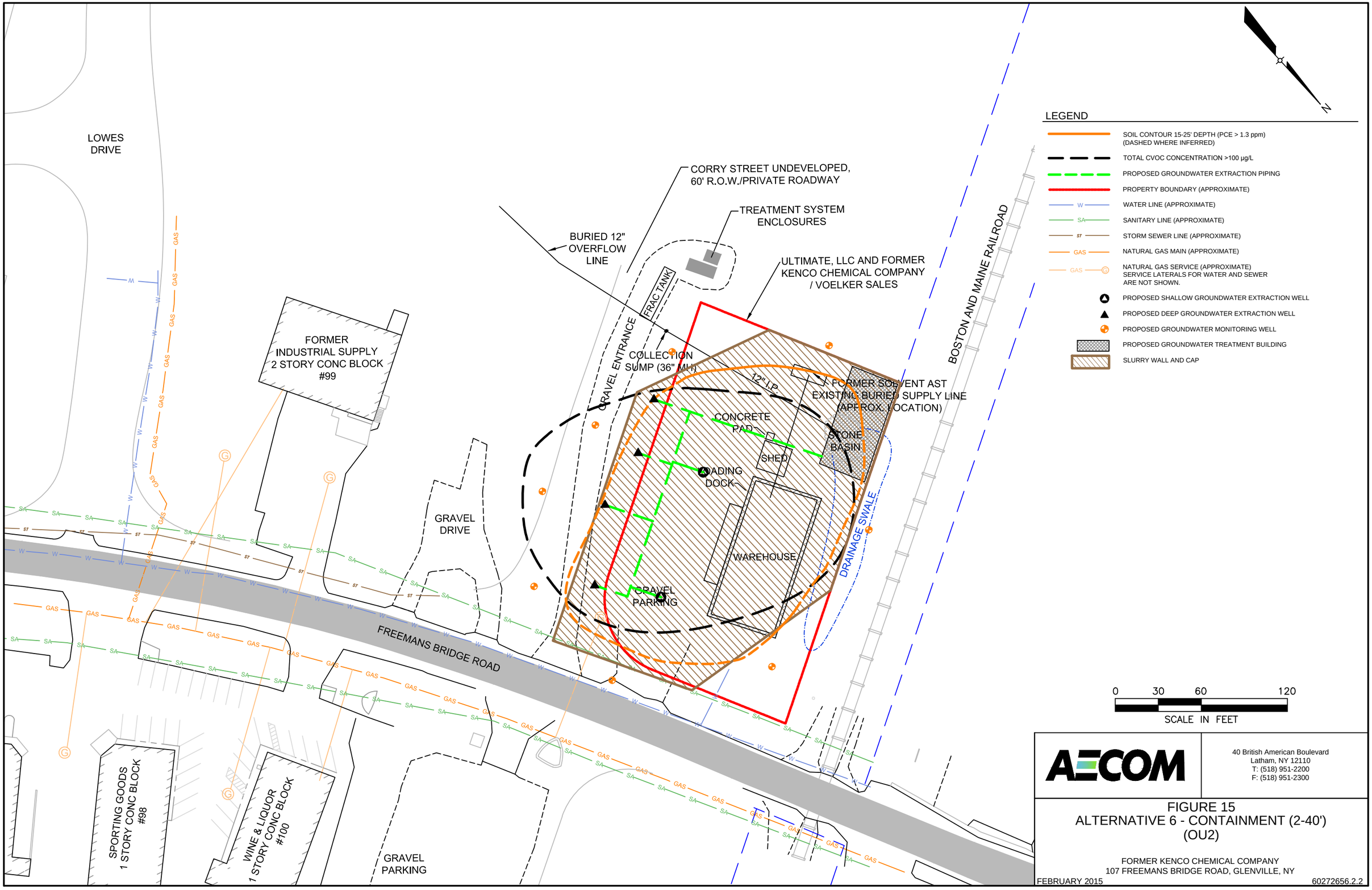

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FIGURE 15
ALTERNATIVE 6 - CONTAINMENT (2-40') (OU2)

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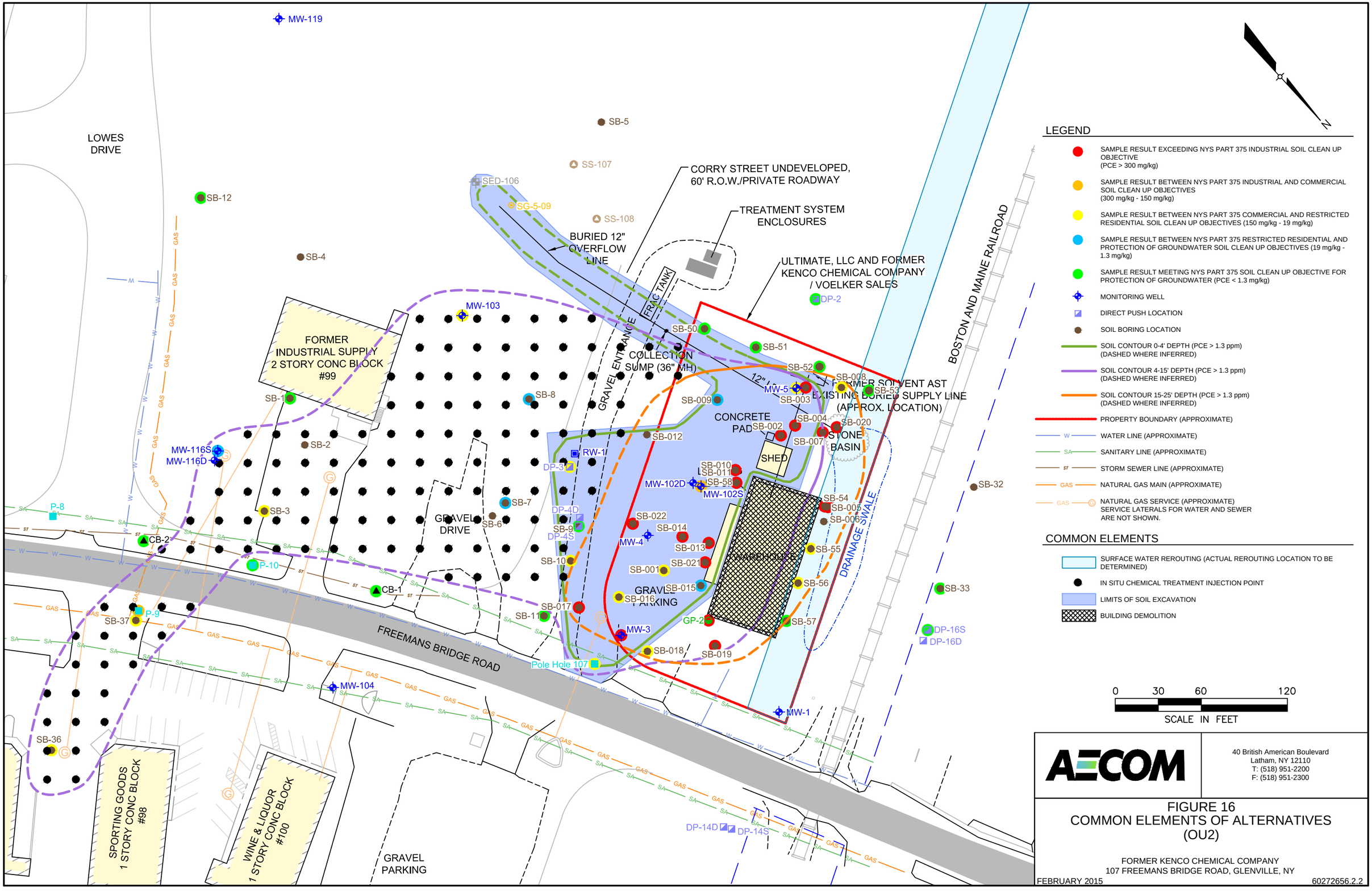

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FIGURE 16
COMMON ELEMENTS OF ALTERNATIVES (OU2)

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