AECOM Environment

Prepared for:
New York State Electric and Gas Co.

Prepared by:
AECOM
Chelmsford, MA
60149563
November 13, 2012

Feasibility Study Report

Former Manufactured Gas Plant Site
Village of Penn Yan, Yates County, New York

NYSDEC Site No: # 8-62-009

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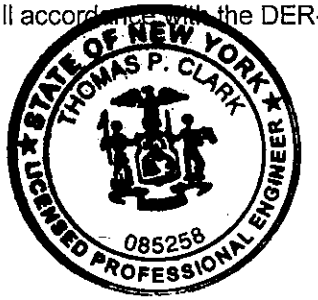
CERTIFICATION

I Thomas P. Clark certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.



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11/13/12
Date

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List of Acronyms

bgs	below ground surface
BTEX	Benzene, toluene, ethylbenzene and xylene
CAMP	Community Air Monitoring Plan
cfs	cubic feet per second
cm/sec	centimeter per second
COC	Constituents Of Contamination
CY	Cubic Yards
DER	Division of Environmental Remediation
EqP	Equilibrium Partitioning
ERL	Effects Range Low
ERM	Effects Range Median
FS	Feasibility Study
FWIA	Fish and Wildlife Impact Analysis
GAC	Granular Activated Carbon
HASP	Health And Safety Plan
ICP	Inductively Coupled Plasma
IRM	Intermediate Remedial Measures
ISCO	In Situ Chemical Oxidation
ISS	In Situ Solidification
KLOC	Keuka Lake Outlet Compact
mg/Kg	milligrams per kilogram
MGP	Manufactured Gas Plant
MNA	Monitored Natural Attenuation
MNR	Monitored Natural Recovery
NA	Natural Attenuation
NAPL	Nonaqueous Phase Liquid
NAVD88	North American Vertical Datum of 1988
NCP	National Contingency Plan
NYSCC	New York State Conservation Commission
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSEG	New York State Electric & Gas Corporation
O&M	Operation And Monitoring
OM&M	Operations, Maintenance And Monitoring
PAHs	Polynuclear Aromatic Hydrocarbons
POTW	Publicly Owned Treatment Works
ppm	parts per million
RAGs	Remedial Action Goals
RAOs	Remedial Action Objectives
RI	Remedial Investigation
SCGs	Standard Criteria and Guidance
SCOs	Soil Cleanup Objectives
SI	Supplemental Investigation
SLC	SLC Consultants/Constructors, Inc.
SMP	Site Management Plan

SPDES	State Pollutant Discharge Elimination System
SVE	Soil Vapor Extraction
SVOCs	Semivolatile Organic Compounds
SWPPP	Storm Water Pollution Prevention Plan
TAGM 4046	Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels
TAL	Target Analyte List
TBC	To Be Considered
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total organic carbon
TPAH	Total Polycyclic Aromatic Hydrocarbons
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
VOCs	volatile organic compounds
WQC	Water Quality Criteria
ZHE	Zero Headspace Extractor
TRC	TRC Environmental Consultants
TVOC	Total Volatile Organic Compounds

Executive Summary

This Feasibility Study Report (FS) presents the results of the remedial action selection process for a former manufactured gas plant (MGP) site (NYSDEC Site No.8-62-009) located in the Village of Penn Yan, Yates County, New York. The FS has been prepared for New York State Electric & Gas Corporation (NYSEG) by AECOM. The purpose of the FS is to present remedial action goals and objectives, available remedial action methods, and a selection of the most appropriate methods to address the environmental conditions encountered at the site. The FS has been prepared in accordance DER-10, Technical Guidance for Site Investigation and Remediation (DER-10).

Site Conditions

The site is located between Water Street and the Keuka Lake Outlet (outlet) in the Village of Penn Yan, Town of Milo, Yates County, New York. The site is comprised of two contiguous parcels of land which are both owned by NYSEG. Both parcels are zoned for commercial use by the town. The outlet bounds the site to the south. The outlet is classified as a Class C waterway by the NYSDEC. The land adjacent to the south shore of the outlet has been developed by the Village of Penn Yan as a recreational hiking and biking trail. The site is located in an urban setting where the surrounding land is used for residential, commercial, and industrial purposes.

A number of environmental investigations have been performed at the site between 1986 and 2006. These investigations were documented in the Remedial Investigation (RI) Report (AECOM, 2008). The RI indicates that coal tar which contains volatile and semi-volatile organic compounds including benzene, toluene, ethylbenzene, and xylenes (BTEX), and polynuclear aromatic hydrocarbons (PAHs) is present in subsurface soils and groundwater at the site. Sediment adjacent to the site has also been impacted by coal tar constituents and NAPL.

Three subsurface soil units have been identified in the upland portion of the site. Fill was observed to be present in all areas of the site in thicknesses that ranged from 13 feet to approximately 4 feet. The thickness of the fill in the area adjacent to the outlet is approximately 8 feet. The fill is comprised of sand and silt with varying amounts of coal fragments, clinker-like material, ashes, coke fragments, and glass and metal debris. Beneath the fill is a thick layer of glacial outwash and lakebed deposits that are comprised of varying amounts of clay, silt, sand, and gravel. The shale bedrock unit that underlies the site is present at a depth of greater than 300 feet below ground surface (bgs). Sediments in the outlet are predominantly comprised of silt with varying amounts of clay, sand, gravel, and cobbles. The sediment layer varies in thickness from about 2 feet to 7 feet. A layer of silt is found beneath the sediment.

The groundwater table is present between 3 and 15 feet bgs across the upland portion of the site. Groundwater flows from the northwest to the southeast from the upland to the outlet. Groundwater from the site is likely discharging into Keuka Lake Outlet.

Eleven (11) shallow groundwater monitoring wells were installed during the RI and previous investigations. Groundwater monitoring included sampling of all 11 wells. The results of monitoring indicate that MGP site-related, dissolved-phase groundwater plume is limited to the area around the location of former Tar Tank B. A well installed between the tank pit and the outlet was the only site well to have VOC or PAH compounds in concentrations greater than the NYSDEC groundwater standards.

Six surface soil samples collected and analyzed during the RI and earlier investigations indicate that surface soil at the site is impacted by COC associated with past MGP operations. Forty-nine subsurface soil samples were collected and analyzed for MGP compounds. The results of that sampling indicate that two areas of subsurface soil at the site are impacted by COC, including the former location of an underground storage tank near the outlet and the former location of a gas holder. Logs from soil borings show that the same areas are impacted by visual evidence of coal tar or NAPL.

More than 70 sediment samples were collected for laboratory analysis from upstream of, next to, and downstream from the site. The results of that sampling indicate that sediment in the outlet is impacted by organic constituents. The results of sediment coring and sounding indicate that sediment in several locations next to the site is visually impacted by coal tar and NAPL.

An assessment was performed to evaluate potential human exposures to COC at the site. In the assessment, media having elevated concentrations of COCs were evaluated for potentially complete human exposure pathways through ingestion, dermal contact and inhalation. The exposure assessment identifies a number of potential on-site and off-site receptors to COC in impacted soil, groundwater and sediment. The screening identifies the following receptors as those likely to have exposures:

- Workers who mow the grass in the central area of the site could be exposed to low-level concentrations of COC.
- Subsurface workers who perform excavation work on the NYSEG property could be exposed to coal tar, coal tar-impacted soil, or coal tar-impacted groundwater if work is conducted in the area south of the Gas Holder and the former Tar Tank B tank pit area.
- Recreational users who use the Keuka Lake Outlet could potentially be exposed to MGP-impacted sediments while completing activities such as wading for fishing

Based on the descriptive summary of the site and surrounding ecological resources a high value habitat does exist in the area surrounding the site. The terrestrial area of the site is not considered to be a high value habitat for plant or wildlife species because it is mostly covered by a building, driveways, and a concrete floor from a former building. The Keuka Lake Outlet and associated fauna is of concern for the MGP site-related impacts and potential ecological exposure. The outlet provides high resource value to aquatic life in this area.

Analysis indicates that a complete exposure pathway exists for ecological receptors in the outlet to be exposed to PAHs in both the upstream area, which could not possibly be impacted by the MGP site, and in the reach of the outlet adjacent to the site. The presence of the PAHs at the concentrations detected does pose some level of risk for this potential receptor group.

Remedial Action Objectives and Criteria

The first step in the remedy selection process described in DER-10 is establishment of remedial action objectives and criteria to be used to evaluate the expected performance of remedial technologies to be applied at the site. These factors are then used to determine areas on-site where specific media need to be remediated. Remedial Action Objectives (RAOs) are site- and medium-specific objectives established to ensure that the remedial action will be protective of human health. RAOs for impacted media identified at the site; including surface soil, subsurface soil, groundwater, NAPL, sediment, and soil vapor are presented in Table 3-1.

Remedial Action Criteria are medium- and contaminant-specific numerical or qualitative standards that can be compared directly to the results or predicted results of remedial actions to verify compliance with RAOs. Criteria established for each impacted medium include the following:

- Surface soil – Soil cleanup objectives (SCOs) for individual contaminants included in 6NYCRR 375-6 – Restricted Use Soil Cleanup Objectives for Protection of Human Health for commercial exposures.
- Subsurface soil – SCOs for total volatile organic compounds (VOCs) total semi-volatile organic compounds (SVOCs), and individual SVOC compounds included in New York's guidance for Determination of Soil Cleanup Objectives and Cleanup Levels (TAGM 4046).
- Groundwater – Ambient water quality standards for individual contaminants established in NYSDEC's Technical and Operational Guidance Series 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1)
- NAPL – Visual observation of subsurface soil which is saturated with coal tar NAPL or which contains heavy coal tar staining, sheen, or NAPL blebs.
- Sediment – Background sediment total polynuclear aromatic hydrocarbon (TPAH) concentrations established based on samples collected upstream and downstream from and next to the site.

These criteria have been compared with data collected during the RI and other investigations to determine the areas on-site where criteria are exceeded. Figures 3-1 through 3-5 show the areas for surface soil, subsurface soil, groundwater, NAPL, and sediment, respectively.

Evaluation of Remedial Technologies and Alternatives

Once areas on-site where remedial criteria are exceeded are established, a range of remedial technologies are evaluated which may be effective in meeting RAOs in those areas. The technology evaluation for each affected medium at the Penn Yan site is summarized in Tables 4-4 through 4-7.

Following the technology evaluation, technologies that were retained have been combined into site-wide remedial alternatives that address the remedial goals for all of the media of concern. Because selection of a remedial action for upland onsite areas is generally independent from those for the wetland area, alternatives for these two areas have been developed and evaluated separately. Alternatives for the upland areas have been designated with a "U" prefix and those for the sediment area have been given a "S" designation.

Alternatives developed for the upland area include the following:

- Alternative U-1 – No Action
- Alternative U-2 – Institutional Controls, Excavation of Surface Soil, Removal of Subsurface Piping, Soil Cover, and MNA of Groundwater
- Alternative U-3 - Excavation of Surface Soil and Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater
- Alternative U-4 – Excavation of Surface Soil and Subsurface Soil Which Exceeds Unrestricted Use SCOs, Removal of Subsurface Piping, and MNA of Groundwater

Alternatives developed for the sediment area include the following

- Alternative S-1 – No Action
- Alternative S-2 – Excavation/Dredging of Surface Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR
- Alternative S-3 – Excavation/Dredging of Surface Sediment and Subaqueous Capping
- Alternative S-4 – Full Excavation/Dredging of Impacted Sediment and Placement of Backfill

Drawings showing the layout of the components of these alternatives are shown in Figures 5-1 through 5-6.

DER-10 establishes eight criteria by which remedial alternatives must be evaluated. A summary of the evaluation is presented in Table 5-1. A comparison of the relative performance of the alternatives on the eight criteria is summarized in Table 6-1.

Recommended Remedial Alternative

Based on the evaluation, alternatives for the upland and wetland areas of the site are recommended. These have been combined into a single site-wide alternative which addresses exposures and RAOs for the entire site. The recommended remedy, shown in Figure 6-1, combines Alternatives U-3 (Excavation of Surface Soil and Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater) and S-2 (Excavation/Dredging of Surface Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR).

1.0 Introduction

This Feasibility Study Report (FS) presents the results of the remedial action selection process for a former manufactured gas plant (MGP) site (NYSDEC Site No. 8-62-009) located in the Village of Penn Yan, Yates County, New York. The site location is illustrated in Figure 1-1. The FS has been prepared for NYSEG (New York State Electric & Gas Corporation) by AECOM. The purpose of the FS is to present remedial action goals and objectives, available remedial action methods, and a selection of the most appropriate methods to address the environmental conditions encountered at the site.

The FS has been prepared in accordance with the most recent and applicable guidelines of the New York State Department of Environmental Conservation (NYSDEC) including DER-10, Technical Guidance for site Investigation and Remediation (DER-10) (NYSDEC, 2010), the United States Environmental Protection Agency (USEPA), and the National Contingency Plan (NCP [40 CFR 300]).

1.1 Purpose

DER-10 specifies that the FS Report should be prepared by the party responsible for conducting remediation and submitted to NYSDEC's Division of Environmental Remediation (DER) for approval prior to implementation of the remedy. The purpose of the FS Report is to develop alternative remedies for the site, evaluate the alternatives based on established criteria, and make a recommendation for an appropriate final remedy. DER-10 specifies that the FS Report should document the completion of the following activities:

- Identify the goal of the remedial program
- Develop the Remedial Action Objectives (RAOs) for the site
- Implement the specified decision-making process outlined in DER-10 to identify and evaluate appropriate remedial options
- Develop and provide a detailed description of the proposed remedy
- Demonstrate the remedy can achieve the cleanup goals for the site.

1.2 Report Organization

DER-10 identifies seven specific elements that should be included in a FS. Those elements, and the locations in this report where they are presented, include the following:

- Purpose — Section 1.1
- Site description and history — Section 1.3
- Summary of remedial investigation and exposure/risk assessment — Section 2
- Remedial goals and remedial action objectives — Section 3
- General response actions — Section 4.1
- Identification and screening of technologies — Sections 4.2 and 4.3

- Development and analysis of alternatives Section 5

1.3 Site Description and History

1.3.1 Site Description

The site is located between Water Street and the Keuka Lake Outlet (outlet) in the Village of Penn Yan, Town of Milo, Yates County, New York. The location of the site is shown on Figure 1-1. The site layout and current features are shown on Figure 1-2. The site is comprised of two contiguous parcels of land which are both owned by NYSEG. Both parcels are zoned for commercial use by the Town of Milo, New York.

The larger parcel, with an area of 0.805 acres, includes the area formerly used for MGP process operations. One vacant building is currently present at the parcel which is the building formerly used for MGP process operations. The site is within the Crooked Lake Historic District and this building has recently been designated as a historic structure by the New York State Office of Parks, Recreation, and Historic Preservation in accordance with Section 106 of the National Historic Preservation Act of 1996. A concrete floor slab from a former warehouse/garage that was demolished in 2004 is present to the west of the building. The remaining areas of the parcel consist of driveways, a parking area along Water Street, a mowed, grass-covered area in the central area of the site, and a riparian strip of land along the outlet.

The smaller parcel of the site is located adjacent to Water Street to the northeast of the former MGP process area. This parcel covers a total land area of approximately 0.01 acres. A small building is currently present at the parcel which is used by NYSEG as a gas regulating station.

The site is located in an urban setting where the surrounding land is used for residential, commercial, and industrial purposes. Immediately to the north of the site is Water Street. Farther to the north of the street are two commercial properties. A bank is present on the corner of Water and Liberty Streets. The second property is a vacant parking lot which was formerly used for automobile sales.

The Keuka Lake Outlet bounds the site to the south. The outlet is classified as a Class C waterway by the NYSDEC. In the reach of the outlet adjacent to the site, the outlet is approximately 95 feet wide. The land adjacent to the south shore of the outlet has been developed by the Village of Penn Yan as a recreational hiking and biking trail (Keuka Outlet Trail). The water level in the outlet is controlled by the Keuka Lake Outlet Compact (KLOC) organization which manages the Keuka Lake water levels to protect lake-side property and to prevent downstream flooding. The KLOC operates six flow control gates which are located at the Main Street Bridge, approximately 600 feet downstream of the site. The water level in the outlet typically varies between the maximum desirable lake level of 714.2 feet above North American Vertical Datum of 1988 (NAVD88), and the minimum desirable level of 713.7 NAVD88. Based on information from a United States Geological Survey (USGS) gauging station ¼-mile upstream of the site, the average flow rate for the outlet is 206 cubic feet per second (cfs).

The site is bounded to the west by a commercial property located at 128 Liberty Street. To the east of the site is property located at 84-134 Water Street which is owned by the Birkett Mills Company. This property is covered by grassy areas, parking lots, driveways, and buildings with storefronts along Water Street. Birkett Mills operates an active agricultural mill facility further to the east of the site at the corner of Water and Main Streets.

1.3.2 Site History

The site was initially developed as a malt house and wood storage facility. The MGP was constructed in 1899 and operated until 1931. During this period gas was manufactured using a coal gasification process using coal, coke, and water. The operating companies included the Penn Yan Gas Light Company (1889–1926) and the New York State Central Electric Corporation (1927–1931). Gas was distributed to consumers through buried mains and used primarily for illumination. Several byproducts from the MGP process including coal tar, ash, and purifier waste were stored on site and either sold or disposed of offsite.

Following the decommissioning of the MGP, the property was purchased by Penn Yan Wine Cellars, Inc., and the site was redeveloped as a wine sales and distribution facility. A warehouse building was constructed to the west of the MGP Building. The site was later used as an auto sales and repair facility by Lake County Ford Mercury, Inc. The warehouse building was converted into a garage at that time.

2.0 Summary of Remedial Investigation and Exposure/Risk Assessment

2.1 Summary of Previous Investigations

Between 1986 and 1990, TRC performed fieldwork at the site that included the excavation of test pits; the completion of soil borings; the installation of monitoring wells; and the analyses of soil, surface water, groundwater, and sediment samples (TRC, 1986, 1990a).

During the period between September 1991 to May 1992, SLC Consultants/Constructors, Inc. (SLC) performed remedial work at the site (SLC, 1991 and 1992). Subsurface Tar Tank A was uncovered and cleaned out. The 3,000 gallon underground storage tank (UST) located between the warehouse/garage building and the outlet (Tar Tank B) was also decommissioned, cleaned-out and removed. Tar-impacted soil was excavated from the tank pit area.

A Supplemental Investigation (SI) was performed by Geraghty and Miller, Inc. in June 1994 (Geraghty and Miller, 1994b). The SI included the completion of three soil borings and the collection of additional sediment samples. Following the SI, eight rounds of groundwater sampling were performed including sampling in November 1991, November 1992, November 1993, July 1994, April 1995, April 1996, April 1997, and April 1998.

In 2006 a Remedial Investigation (RI) was performed for NYSEG by AECOM. The RI fieldwork on the site consisted of the collection of surface soil samples, the excavation of test trenches in and around subsurface features, the installation of soil borings and monitoring wells, and the collection of groundwater samples. Soil and groundwater samples were collected on the adjacent property to the east of the site, and groundwater samples were collected from the property to the west of the site. The field activities for the Keuka Lake Outlet area consisted of the systematic hand-probing of sediments to assess the limits of the visible evidence of coal tar sheen and coal tar NAPL blebs for MGP-related sediment impacts, followed by the collection of shallow sediment samples at upstream locations and from areas adjacent to and downstream of the site. Deeper sediment samples were collected by coring to determine the depth of the MGP-related impacts. A bathymetric survey was performed to obtain data to map the surface of the sediments in the outlet area.

2.2 Geology and Hydrogeology

This section describes the regional geologic setting of the Penn Yan area, and describes the site geological and hydrogeological conditions discovered during Remedial Investigation activities.

2.2.1 Geology

2.2.1.1 Upland Site Area

Information regarding the geology of the site was obtained from the test trenches and subsurface soil borings. Two cross-sectional views of the site have been prepared to illustrate the subsurface conditions. The locations of the cross-sections are shown on Figure 2-1, and the cross-sections are included as Figure 2-2 (Cross-section A-A'), Figure 2-3 (Cross-section B-B'), Figure 2-4 (Cross-section C-C'), Figure 2-5 (Cross-section D-D').

As shown on the figures, three subsurface units were identified as a result of the investigation activities. The units include the following:

- **Fill** – Fill was observed to be present in all areas of the site in thicknesses that ranged from 13 feet in the area adjacent to Water Street, to approximately 4 feet in the area around the MGP Building. The thickness of the fill in the area adjacent to the outlet is approximately 8 feet. The fill is comprised of sand and silt with varying amounts of coal fragments, clinker-like material, ashes, coke fragments, and glass and metal debris.
- **Alluvial/Glacial Deposits** – Beneath the fill is a thick layer of glacial outwash and lakebed deposits that are comprised of varying amounts of clay, silt, sand, and gravel. The uppermost portion of this unit has been reworked by post-glacial alluvial action.
- **Bedrock** – The shale bedrock unit that underlies the site was not encountered during the RI. Based on information provided by a local water well drilling company which has drilled a well for their shop on the west side of Liberty Street, the bedrock unit in the area of the site is likely to be present at a depth of greater than 300 feet below ground surface (bgs).

2.2.2 Keuka Lake Outlet

The shallow and deep sediment sampling completed in the outlet indicates that the sediments are predominantly comprised of silt with varying amounts of clay, sand, gravel, and cobbles. The stratigraphy of the sediments in relation to the upland portion of the site is shown on Figures 2-2, 2-4, and 2-5.

2.2.3 Hydrogeology

The water level measurements taken from the shallow site wells indicate that the groundwater table is present between 3 and 15 feet bgs across the upland portion of the site. The data obtained from the shallow wells on October 25, 2006 has been used to map the flow direction for groundwater across the site. As shown on Figure 2-6, groundwater flows from the northwest (MW1S–721.93 feet NAVD88) to the southeast (MW8S–713.42 feet NAVD88) with an approximate gradient of 0.034 feet/foot across the site. The direction of groundwater flow observed during the RI is similar to the direction of groundwater flow observed during the previous investigations performed at the site. The groundwater from this site is likely discharging into Keuka Lake Outlet in the reach adjacent to the site.

Vertical hydraulic gradient measurements are based on measurements taken at two multi-level well clusters. At wells MW1S (shallow) and MW1D (deep), the piezometric surface measured at MW1D was 0.06 feet higher in elevation than in the adjacent well MW1S. At wells MW4S and MW4D, artesian conditions were observed at MW4D, while the surface of the water table was found to be 3.25 feet bgs at MW4S. These measurements show an upward gradient for groundwater flow from the deeper to the shallower portions of the aquifer at the site.

Horizontal hydraulic conductivity testing was performed for six site wells by TRC (TRC, 1990a). The conductivity measurements ranged from 1×10^{-3} centimeter per second (cm/sec) to 7×10^{-5} cm/sec, the results of the conductivity testing are consistent with the results that would be anticipated for the range of materials observed at the site including clay, silt, and fine sand.

Groundwater is not used for drinking water in the immediate vicinity of the site. Drinking water for the Village of Penn Yan is provided by municipal sources.

2.3 Nature and Extent of Contamination

The most recent field investigation was conducted by AECOM in 2006 to better define the nature and extent of impacts identified in previous site studies. The investigative activities performed and their results are discussed below along with the results of the previous investigations.

2.3.1 Surface Soil

Four surface soil samples were collected during the RI from the grass-covered areas of the site. The samples were analyzed for Target Compound List (TCL) semivolatile organic compounds (SVOCs), Target Analyte List (TAL) metals, and total cyanide.

Each of the samples contained individual polycyclic aromatic hydrocarbons (PAHs) compounds in concentrations greater than the method reporting limits. Total PAH (TPAH 14 – the sum of 14 TCL PAHs) concentrations ranged from 9 milligrams per kilogram (mg/Kg) to 29 mg/Kg. Each of the four surface soil samples contained lead in concentrations ranging from 82 mg/Kg to 95 mg/Kg.

Surface soil sample locations and sampling results from historical sampling events and the RI are summarized on Figure 2-7.

2.3.2 Subsurface Soil

Test trenches and soil borings were completed in and around MGP features to determine the condition of subsurface soil. Direct-push soil borings were advanced below all areas with observed impacts to delineate potential downward migration of residuals and to confirm non-impacted conditions. Approximately 49 subsurface soil samples were collected and submitted for chemical analysis of volatile organic compounds (VOCs), SVOCs, metals, and total cyanide.

Only two of the samples collected during the RI contained BTEX compounds in concentrations greater than the NYS Unrestricted Soil Cleanup Objectives (SCOs). These samples included SB22(6.5-7.5), a sample collected from the area adjacent to the remedial excavation for Tar Tank B, and SB27(3-4.5), a sample from the fill material in the area to the south of the Gas Holder (Figure 2-8). Benzene, toluene, ethylbenzene and xylene (BTEX) compounds were not detected in concentrations greater than the method reporting limits for deeper samples collected from each of these borings.

Tar-impacted subsurface soil with PAH concentrations greater than Commercial SCOs are present in areas adjacent to the excavated tank pit for former Tar Tank B down to a depth of 12 feet bgs. Based on laboratory samples collected below the impacted zone, deeper migration of residuals has not occurred in this area.

Three shallow impacted subsurface soil (less than 5 feet bgs) with PAH concentrations greater than Commercial SCOs are present in the area to the south of the Gas Holder. Based on laboratory samples collected below the impacted zone, deeper migration of residuals has not occurred in this area.

Only one of the 49 RI samples analyzed contained metals in concentrations greater than the Commercial SCOs. The sample was collected from native soil from a depth of approximately 13 feet below the fill layer. The source of the arsenic at this location and depth is unknown; however, arsenic impacts do not appear to be wide-spread at the site. All of the cyanide detections were less than the Unrestricted SCO of 27 mg/Kg.

Test pits excavated during the RI found several sub-surface structures. Impacts associated with the structures include the following: An intact gas holder floor was found during the investigation. A limited area of the floor had cobble-sized pieces of hardened coal tar present. Coal tar was observed in a process pipe located adjacent to the gas holder foundation. Potential impacts related to the pipe will be further investigated during site remediation. A subsurface utility tunnel (unknown structure #3) was encountered during the test pit excavated to the south of the gas holder foundation. Fill material in the structure was observed to have a coal tar sheen.

Two samples of the most impacted media observed during the sampling performed for the RI were analyzed for hazardous characteristics. The analyses were performed to obtain data that could possibly be used for disposal profiling purposes and to obtain data to determine if any materials, if excavated, would need to be managed as a RCRA regulated hazardous waste under 40 CFR 262-270. The analyses included the following; TCLP ZHE (zero headspace extraction) Extraction, TCLP VOC, TCLP SVOC, TCLP ICP Metals, Corrosivity, Ignitability, Reactive Cyanide, and Reactive Sulfide.

The samples include a tar sample from the pipe encountered near the Gas Holder, and a sample of tar-impacted soil collected from the test trench excavated adjacent to the remedial excavation for Tar Tank B. None of the results were greater than the regulatory criteria. Because the sample collected from the pipe was a sample of viscous tar, the laboratory was unable to perform the TCLP VOC extraction for this material. The VOC analyses were completed for total VOCs using USEPA 8260B. Note that, if the 20x rule for the total benzene result of 68 parts per million (ppm) is applied; the TCLP result for this sample would likely have exceeded the TCLP limit of 0.5 ppm.

Subsurface soil sample locations and sampling results from historical sampling events and the RI are summarized on Figure 2-8.

2.3.3 Groundwater

Eleven (11) shallow groundwater monitoring wells were installed during the RI and previous investigations at upgradient, cross-gradient and downgradient locations from various former MGP features. Groundwater monitoring included sampling of all 11 wells. The groundwater samples were submitted for chemical analysis of TCL VOCs, TCL SVOCs, TAL metals, and total cyanide. The MGP site-related, dissolved-phase groundwater plume is limited to the area around the tank pit for former Tar Tank B. Well MW7S, a well installed between the tank pit and the outlet was the only site well to have VOC or PAH compounds in concentrations greater than the NYSDEC groundwater standards. The highest concentrations detected were only slightly greater than the groundwater standards.

Groundwater and historical surface water sampling results from historical sampling events and the RI are included on Figure 2-9.

2.3.4 Sediment

Sediment samples were collected in the Keuka Lake Outlet as part of the RI fieldwork. Twenty-one (21) shallow sediment samples were collected as upstream background samples. An additional 33 shallow sediment samples were collected at locations in the outlet adjacent to and downstream of the former Tar Tank B to the Main Street Bridge. Deeper sediment samples were collected from 23 locations using a vibracore drill. Surface (0-6 inches) sediment samples were analyzed for the following parameters; TCL SVOCs, Total cyanide, Total organic carbon (TOC). The deeper sediment

samples collected from the vibracore samplers were analyzed for the following parameters; TCL SVOCs and TOC.

Fifteen out of the 21 samples from the upstream area had TPAH14 concentrations greater than the NYSDEC Effects Range Low (ERL) chronic screening criteria of 4 mg/Kg. One sample had a TPAH14 concentration of 81 mg/Kg which is greater than the Effects Range Median (ERM) acute screening criteria of 45 mg/Kg. The highest concentrations of PAHs in the area upstream of the site were detected in samples collected adjacent to storm sewer outfalls which discharge storm water from the urban area of the Village of Penn Yan into the outlet. These concentrations indicate that storm run-off contributes to the elevated PAH levels in the Keuka lake outlet.

The upstream sediment samples were used to calculate a 90^{th} percentile background TPAH17 concentration for the Keuka Lake outlet surface sediments using USEPA's ProUCL statistical software. TPAH17 consists of the TPAH14 compounds with the addition of Benzo(b)fluoranthene, Benzo(k)fluoranthene, and Indeno(1,2,3-cd)pyrene. For the purposes of calculating a representative background number, non-detect samples were assumed to have a concentration of one-half of the detection limit for the compound. Five of the samples; BSD02-06, BSD07-06, BSD10-06, BSD11-06, and BSD18-06; were not used in the background calculations at the direction of DEC because they were collected near stormwater outfalls and believed to be unrepresentative of ambient Outlet sediments For the remaining 16 samples, TPAH17 concentrations range from 6.59 to 257 mg/kg.

The ProUCL software was then used to perform an outlier test to identify and remove from the evaluation samples that may be atypical of the data set. Three samples were identified as outliers; two upper end (BSD09-06 and BSD12-06) and one lower (BSD08-06). Following the removal of the outlier samples from the data set, the distribution of the data was calculated using ProUCL. The calculated 90^{th} percentile for the background data is 42.6 mg/kg. The output file for ProUCL is included in Appendix A.

The TOC concentrations for the background sediment samples ranged from 3% to 12% organic carbon. No discernible pattern was evident for the TOC concentrations in the upstream sediment sample area. Total cyanide was not detected in any of the samples in concentrations greater than the laboratory reporting limits.

The shallow samples indicated that visible evidence of MGP-related residuals is present in sediments adjacent to the site to a distance approximately 270 feet downstream of this area. The concentrations of TPAH14 ranged up to 3,900 mg/Kg in the area with MGP-related impacts. Further than approximately 360 feet downstream of Tar Tank B, surface sediment PAH concentrations were found to decrease to be within the anticipated range for the samples collected from the upstream area.

The results of probing downstream at SD24 indicated that a hydrocarbon material is present in an approximately 10-foot square area between Outfalls #17, #18, #19, and #20. When the sediments were probed in this area, blebs of viscous, brown material floated to the water's surface and formed a crust when exposed to air. When this layer was contacted, it did not disperse rapidly like a typical MGP-related hydrocarbon sheen would be expected to. Instead, the crusted-over layer broke up into small blocks of material. The material was observed to have a turpentine-like odor. These results also indicate that some impacts in sediment in the outlet are not related to the MGP site.

TOC ranged in concentration between 1% and 31%. No discernible pattern was observed for the TOC results in the outlet adjacent to the site. Total cyanide was not detected in concentrations greater than the method reporting limits for any of the surface sediment samples.

In general, the results of the PAH analyses for the deeper samples confirm the results of the visual characterization which indicated that significantly elevated concentrations of MGP-related constituents of contamination (COC) do not appear to be present at depths greater than 5 feet below the sediment surface in the area near the site, and that the MGP-impacted zone becomes shallower moving away from this area. The results of the deeper coring provide additional information indicating that the impacts are shallow and are likely due to overflow spills from the site, not from deeper migration from the site to the outlet through the subsurface soils.

TOC concentrations in the deeper sediments ranged from approximately 1% to 4%. Similar to the shallow sediment samples, no discernible pattern was observed for the TOC concentrations.

Sediment sampling results from historical sampling events and the RI are included on Figure 2-10.

2.4 Baseline Risk Assessment Summary

An exposure assessment evaluating exposures to COCs by human and ecological receptors was completed as part of the RI.

2.4.1 Human Health Exposure Assessment

In the assessment, media having elevated concentrations of COCs were evaluated for potentially complete human exposure pathways through ingestion, dermal contact and inhalation.

The property is currently zoned for commercial use, and the expected future land use is nonresidential. NYSEG is committed to keeping the site nonresidential and is willing to seek an environmental easement on the property to prohibit the future use of the site for residential development.

The exposure assessment identifies a number of potential on-site and off-site receptors to COC in impacted soil, groundwater and sediment, and subjects those receptors to a screening process. This screening identifies the following receptors as those likely to have exposures:

- Workers who mow the grass in the central area of the site could be exposed to low-level concentrations of COC.
- Subsurface workers who perform excavation work on the NYSEG property could be exposed to coal tar, coal tar-impacted soil, or coal tar-impacted groundwater if work is conducted in the area south of the Gas Holder and the former Tar Tank B tank pit area.
- Recreational users who use the Keuka Lake Outlet could potentially be exposed to MGP-impacted sediments while completing activities such as wading for fishing or swimming.

Based on the limited areal extent of the areas with MGP-impacted material, the low concentrations of VOCs in soil and groundwater, and the distances to the nearest occupied buildings, soil vapor intrusion sampling was not included in the RI work scope. If site use changes in the future, the need for soil vapor intrusion investigation, and/or possible mitigation measures will be evaluated at that time.

2.4.2 Potential Ecological Impact Evaluation

Based on the NYSDEC FWIA Step 1 descriptive summary of the site and surrounding ecological resources a high value habitat does exist in the area surrounding the site. The terrestrial area of the site is not considered to be a high value habitat for plant or wildlife species because it is mostly covered by a building, driveways, and a concrete floor from a former building. The Keuka Lake Outlet and associated fauna is of concern for the MGP site-related impacts and potential ecological exposure. The outlet provides high resource value to aquatic life in this area.

The Step IIA and IIB analysis indicates that a complete exposure pathway exists for ecological receptors in the outlet to be exposed to PAHs in both the upstream area, which could not possibly be impacted by the MGP site, and in the reach of the outlet adjacent to the site. The presence of the PAHs at the concentrations detected does pose some level of risk for this potential receptor group.

3.0 Remedial Action Objectives

DER-10 specifies the process to be followed to select a remedy to address environmental conditions at a contaminated site. The first step in that process is establishment of remedial action goals, objectives, and criteria to be used to evaluate the expected performance of remedial technologies to be applied at the site.

3.1 Standards, Criteria and Guidance

An evaluation of whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance is required during this remedy selection process. Potentially applicable standard criteria and guidance (SCGs) for the site are listed in Tables 3-1, 3-2, and 3-3, which list chemical-specific, action-specific, and location-specific SCGs, respectively as well as other documents which are to be considered (TBC) when evaluating remedial objectives and technologies.

3.2 Remedial Action Goals

Remedial Action Goals (RAGs) are general, non-site specific standards, established by the State, which are used to help develop site-specific Remedial Action Objectives. RAGs have been established for remedial actions implemented under NYSDEC's Inactive Hazardous Waste Disposal Site Remedial Program (State Superfund), including the following:

- At a minimum, to eliminate or mitigate all significant threats to the public health and to the environment presented by contaminants disposed at the site
- To restore the site to pre-disposal conditions, to the extent feasible.

3.3 Remedial Action Objectives

RAOs are site- and medium-specific objectives established to help meet the RAGs described in the previous section. The RI Report included a qualitative assessment of potential risks associated with contamination at the site. Addressing those potential risks will be required in order for a remedial action to meet the "protectiveness" requirement of the RAGs. The risk assessment identified the following potential exposure pathways related to past MGP operations:

- Surface Soil – no significant exposure pathway was identified
- Subsurface Soil – incidental ingestion, dermal contact, and volatilization to outdoor air
- Groundwater – incidental ingestion, dermal contact, and volatilization to outdoor air
- Sediment – incidental ingestion and dermal contact by humans and environmental receptors

In order to address risks associated with these potential exposures to MGP impacts, RAOs have been developed. These RAOs are presented in Table 3-4.

3.4 Remedial Action Criteria

Remedial Action Criteria are medium- and contaminant-specific numerical or qualitative standards that can be compared directly to the results or predicted results of remedial actions to verify compliance with RAOs. This section presents Remedial Action Criteria developed for each of the RAOs presented above.

3.4.1 Prevent Ingestion/Direct Contact/Inhalation Of Contaminated Soils

Soil criteria will be used to verify compliance with RAOs for prevention of ingestion and direct contact with MGP-impacted surface and subsurface soil. The need for remediation of surface soil will be determined based on 6NYCRR 375-6 - Restricted Use SCOs for Protection of Human Health. Surface soil will be evaluated based on SCOs established for commercial exposures.

Given the infrequency of potential human contact with subsurface soil at the site, NYSEG proposes to apply composite standards for total BTEX and TPAHs to subsurface soil at the site. This is consistent with criteria established at numerous other MGP sites in New York. Since no such composite standards are included in the soil criteria identified in New York regulations, standards established in New York's guidance for Determination of Soil Cleanup Objectives and Cleanup Levels (TAGM 4046) will be used. The need for remediation of subsurface soil will be based on the following as maximum:

- Total VOCs – 10 mg/kg
- Total SVOCs – 500 mg/kg

These values will be established as the basic cleanup criteria for organic constituents in subsurface soil.

Although, based on current or expected future site use they are not applicable, the FS will also consider regulatory soil standards for unrestricted site use included in Subpart 375-6. At least one remedial alternative will be evaluated which is capable of remediating soil at the site to these levels. Appendix B presents a summary of concentration of COC in soil in comparison to Subpart 375-6 SCOs.

3.4.2 Groundwater Quality Criteria

Groundwater quality criteria will be used to verify compliance with RAOs for prevention of ingestion and direct contact with groundwater and restoration of the groundwater aquifer. NYSDEC's Technical and Operational Guidance Series 1.1.1 *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (TOGS 1.1.1) (NYSDEC, 1998) will be used as the source of groundwater quality criteria. Ambient water quality standards and guidance values from TOGS 1.1.1 will be used as cleanup criteria for groundwater based on a GA groundwater classification, although groundwater is not used as a drinking water source near the site.

3.4.3 NAPL Criterion

The NAPL criterion will be used to verify compliance with the RAOs for free product or NAPL as well as RAOs for removal or treatment of the source of groundwater contamination and prevention of migration of contaminants in soil. Achieving this criterion will also ensure that the RAO for soil vapor will be met. The results of past investigations indicate the primary source of COC in groundwater at

the site is coal tar residuals including moderately to grossly impacted soil or fill material exhibiting a visibly identifiable characteristics including coal tar staining, coal tar sheen, trace amounts of coal tar nonaqueous phase liquid (NAPL) blebs, and saturation with tar or NAPL.

This qualitative, visual criterion will be used to classify soil at the site which needs to be addressed to implement source removal.

3.4.4 Sediment Criteria

Steps for establishing cleanup criteria for surficial sediment in New York are discussed in NYSDEC's Technical Guidance for Screening Contaminated Sediments (NYSDEC 1999). Evaluation of sediment COC concentration data indicates that sediment between the site and the Keuka Lake Outlet control structure is impacted above background by coal tar constituents associated with the former MGP site.

In addition, visual criteria will be used to identify sediment impacted by coal tar. As shown on Figure 2-10, sediment in several areas near the former MGP there are visual signs of impacts by coal tar to sediment including heavy stains or sheens or NAPL blebs. This qualitative, visual criterion will be used to classify sediment in the outlet which needs to be addressed to implement source removal in addition to the analytical data criteria for surface sediments.

3.5 Limits and Volumes of Media Requiring Remediation

The previous section identified numerical and qualitative criteria to be applied to the selected remedial action to demonstrate that RAOs will be achieved. In this section, those criteria are applied to the site to identify areas where remediation will be performed.

3.5.1 Surface and Subsurface Soil

Figure 3-1 shows the area where impacts from past MGP operations in surface soil exceed criteria specified in Section 3.4.1. The area shown includes locations where surface soil concentrations of COC are estimated to exceed RCOs for commercial exposures. Based on this area and a depth of one foot, the volume of surface soil that exceeds criteria is 370 cubic yards (CY).

Figure 3-2 shows the area where impacts to subsurface soil exceed criteria. The figure establishes the limits of impacts based on exceedances of standards for subsurface soil described in Section 3.4.1 including the presence of subsurface soils with concentrations of total SVOCs, individual SVOCs, and BTEX which exceed numerical criteria. As the figure shows, an extensive area around the former gas holder is the primary location identified. A review of analytical data for this area indicates that contamination goes no deeper than 7 feet. Based on these estimated areas and depths, the volume of subsurface soil that requires remediation totals 1,130 CY.

The limits of subsurface soil exceeding criteria are estimated based on existing data. These limits will be re-evaluated and modified based on the results of a pre-design investigation.

3.5.2 Groundwater

Figure 3-3 shows the estimated area at the site where groundwater is impacted by COC. The limits shown were established based on the distribution of BTEX and TPAH in groundwater samples collected during past monitoring events. Given the area shown, the approximate 10 foot saturated thickness of the aquifer above the silt layer, and an assumed porosity of 30 percent, the volume of water requiring remediation totals 6,600 cubic feet.

3.5.3 NAPL

Figure 3-4 shows the area where visual impacts have been identified in subsurface soil. The figure establishes the limits of impacts based on exceedances of standards for NAPL described in Section 3.4.3. The limits shown include the area which contains visual evidence of coal tar NAPL. The limits are defined by borings or test pits that had visible evidence of coal tar stains, sheen, NAPL blebs, or coal tar saturated soils. A review of boring logs for these areas indicate that contamination goes no deeper than five feet near the former gas holder and no deeper than seven feet along the southern edge of the site. Based on these estimated areas and depths, the volume of subsurface soil that is impacted by NAPL is totaling to 1,180 CY.

3.5.4 Sediment

Figure 3-5 shows the area in the outlet where sediment has been impacted by COC associated with the former MGP site. It is believed that COC identified in sediment in areas upstream of the site are related to stormwater outfalls or other off-site sources of organic contamination. For that reason, that area is not included in the proposed limits of remediation. As shown, the limits of excavation extend from the site to the Keuka Lake control structure.

4.0 Identification and Screening of Remedial Technologies

4.1 General Response Actions

DER-10 outlines the remedy selection process and states that feasibility studies should include evaluations of "general response actions," "technology types" and "technology process options." General response actions are broad classifications of remedial technologies which describe general strategies for addressing constituents and media of interest. General response actions that will be considered for NYSEG's Penn Yan Former MGP site include the following:

- Groundwater
  - No action
  - Institutional controls
  - In situ treatment (including monitored natural attenuation[MNA])
  - Removal
  - Ex situ treatment and discharge
  - Containment
- Soil
  - No action
  - Institutional/engineering controls
  - Removal
  - In situ treatment
  - Containment/capping
  - Waste management
- Sediment
  - No action
  - Institutional controls
  - Monitoring (including monitored natural recovery [MNR])
  - Treatment
  - Removal
  - Containment
  - Waste management

4.2 Initial Identification and Screening of Remedial Technologies

Technology types are more specific, although still general, classifications of technologies. Technology process options are very specific applications of technology types using particular equipment, processes and materials. Technology types and technology process options associated with the general response actions listed above that will be evaluated for the Penn Yan site are shown on Tables 4-1, 4-2, and 4-3, which summarize the initial identification and screening process for groundwater, soil, and sediment, respectively.

The goal of the initial identification and screening of remedial technologies is development of a list of technology process options which show promise for addressing the particular environmental conditions at the site. In particular, the listing should include representative technology process options for each technology type and general response action. To achieve this goal, a broad list of technology process options has been developed based on literature sources. Sources used to develop this list include the following:

- DER-15: Presumptive/Proven Remedial Technologies for New York State's Remedial Programs (NYSDEC, 2007)
- Treatment Technologies Screening Matrix (USEPA, 1999)
- Citizen's Guides Series (USEPA, 2001)

The technology process options identified were then screened based on their technical implementability and applicability.

4.3 Evaluation of Representative Remedial Technologies

Following completion of the initial identification and screening of remedial technologies, the technologies and process options that have not been eliminated from consideration are subjected to a more formal evaluation. The remaining process options are described in sufficient detail to allow for a more detailed evaluation. The process options are then evaluated in terms of their effectiveness and implementability.

The effectiveness criterion includes factors related to the ability of a remedial technology to meet project objectives, including the following:

- The short-term and long-term effectiveness and performance of the technology to protect human health and the environment
- The ability of the technology and process option to achieve site-specific RAOs
- The ability of the technology to reduce the toxicity, mobility, or volume of site contaminants.

The implementability criterion includes factors related to the ease and predictability of implementation including the following:

- Technical feasibility - includes difficulty of construction, consideration of unusual site conditions/limitations, technology specific regulations, and O&M considerations.

- Administrative feasibility - includes the ability to satisfy regulatory and permit requirements, availability and capacity of treatment, storage, and disposal services, and availability of required equipment and subcontractors.

The goal of the evaluation of representative remedial technologies is the selection of at least one representative process option for each technology type, if possible. The process option selected for each technology type should exhibit the best overall balance of the above criteria. When two or more process options are considered equivalent, one may be selected as representative. In that case, although the eliminated process options are not considered further in the FS, they may be reconsidered during remedy selection or remedial design. The following subsections present separate evaluations for technologies related to groundwater, surface soils, subsurface soils, and sediments. Tables 4-4, 4-5, 4-6, and 4-7 summarize the evaluations for groundwater, surface soil, subsurface soil, and sediment, respectively.

4.3.1 Groundwater

4.3.1.1 No Action

Description

The No Action option requires no further active efforts at the site to either reduce concentrations of site contaminants or to reduce/eliminate exposure pathways to impacted groundwater at the site. No further groundwater monitoring would be conducted and no access or use restrictions would be imposed.

Effectiveness

This technology is not effective because it would not achieve any of the site's RAOs for groundwater. No Action would not reduce or eliminate exposure pathways and it would not reduce concentration, toxicity, mobility, or volume of COC in the contaminated groundwater onsite or offsite. No Action would not reduce the concentrations of contaminants in groundwater, prevent ingestion of groundwater or inhalation of volatiles onsite or offsite, or prevent further offsite migration of contaminants.

No Action would not protect the public (onsite or offsite) from coming into contact with contaminants and would not take any measures to protect groundwater quality or prevent further offsite migration.

Implementability

Since no activities would be occurring on the site, No Action would be easily implemented.

Evaluation

This technology is retained as a baseline to which other remedial technologies are compared.

4.3.1.2 Institutional Controls

Institutional controls for groundwater provide administrative restrictions on groundwater use. Environmental easements, local ordinances, and a site management plan (SMP) were identified as institutional controls to be evaluated.

Environmental easement

Description

An environmental easement is a legally binding limit which can be placed on future site activities or uses (New York State Environmental Conservation Law (ECL) Article 71, Title 36). Such a restriction would be placed on the future use of groundwater at the site as a source for drinking water. The Village of Penn Yan has a public water supply available to neighboring residents; therefore, it is unlikely that groundwater would ever be used for drinking water.

An environmental easement can also be used to implement a SMP. A SMP is a document which describes work procedures to be utilized in order to manage remaining impacts on-site and off-site following the completion of the chosen remedy. The SMP discusses all aspects of any anticipated future work related to the site, including monitoring, inspections, reporting, and operation and maintenance. The NYSDEC has created a template document for the development of site-specific SMPs for projects performed under the Division of Environmental Remediation (NYSDEC, May 2009).

Effectiveness

An environmental easement would meet the RAOs for prevention of onsite ingestion of groundwater and inhalation of volatiles from impacted groundwater because it would control access and exposure to groundwater on the site. It does not reduce concentrations of COC in shallow groundwater or prevent off-site migration of COC. This option does not reduce the concentration, toxicity, mobility, or volume of COC in the shallow groundwater.

A SMP would meet the RAOs for prevention of onsite ingestion of and direct contact with groundwater and inhalation of volatiles from impacted groundwater because it would control access and exposure to groundwater on the site. If necessary, the SMP may include procedures regarding off-site groundwater as well. The SMP does not reduce concentrations of COC in shallow groundwater or prevent off-site migration of COC. This option does not reduce the concentration, toxicity, mobility, or volume of COC in the shallow groundwater.

Implementability

This option is easily implemented.

Evaluation

This option is retained because of its effectiveness in meeting two of the RAOs for groundwater, and the relative ease of implementation.

Local Ordinance

Description

In order to implement this technology, a local ordinance would be passed by the Village of Penn Yan restricting installation of extraction wells on the property.

Effectiveness

Preventing future use of groundwater for potable or other uses will meet the RAO for prevention of exposure to or ingestion of COC in site groundwater.

Implementability

Implementation of a local ordinance is potentially feasible. Because such an ordinance is not currently in place, implementation will require approval by the municipality. Because implementation is not under NYSEG's control, this technology is considered less implementable than other institutional controls.

Evaluation

This technology is not retained for further consideration because more reliable technologies are available to achieve the same goals.

4.3.1.3 *In situ* Treatment

In situ treatment for groundwater provides protection to human and environmental receptors by removing COC from groundwater and soil.

Monitored natural attenuation

Description

MNA of groundwater refers to the monitoring of natural processes that act to reduce concentration, toxicity, mobility, and volume of COC as the groundwater flows through a porous media. At this site, the constituents found above remedial criteria in groundwater are BTEX compounds, PAHs and metals. The amount of benzene and PAHs that can dissolve in the groundwater is a function of their solubility. Typically, lower molecular weight and polar compounds have higher solubility. Other factors affecting solubility include the temperature, pH, and ionic strength of the groundwater. In general, BTEX compounds are much more soluble than most of the PAHs.

Once in solution, the ability of these constituents to be transported within groundwater is a function of the compound's characteristics and the properties of the surrounding soil. In advective transport, the constituents migrate in the direction of groundwater flow. Advective transport is a function of the direction and magnitude of groundwater seepage velocity. If the source of COC is continuous and advection is the only solute transport mechanism, the distribution of COC in the groundwater will expand indefinitely. There are three additional natural mechanisms which can influence a constituent's fate and transport: dispersion, retardation, and degradation. These three factors can reduce the concentration, rate of transport and total mass of these constituents.

Natural attenuation (NA) monitoring would involve the sampling of onsite wells at regular intervals. Samples would be analyzed for BTEX, PAHs, metals, and NA parameters. The results of the sampling events would be used to document any changes in site conditions.

Effectiveness

Based on data collected during the RI, groundwater impacted by COC is present in only a limited area on-site. It is expected that natural attenuation, in conjunction with other remedial technologies, would meet the RAOs within a reasonable period of time. On-site ingestion of shallow groundwater is not prevented with this option, but it could be controlled with an environmental easement as discussed previously. MNA would reduce the toxicity, mobility, and volume of COC in the groundwater, providing long-term protection and minimizing risk. It would not provide short-term protection. Monitoring the groundwater over time would quantify the rate and effectiveness of MNA and would be useful for understanding changes in site conditions. It would be used to determine when COC concentrations

meet cleanup criteria. Since MNA will not be effective in meeting NAPL RAOs, source removal or control is generally an important part of a MNA Remedy.

Implementability

MNA is easily implemented and can be combined with other technologies. Groundwater monitoring would be essential to documenting that attenuation is actually occurring over time. Monitoring equipment is readily available and easy to use. The frequency of monitoring would be established during remedial design. It may be necessary to install additional monitoring wells to more conclusively document the progression of NA over time.

Evaluation

Because it has the potential to prevent off-site migration and to treat residual concentrations of COC, MNA is retained. This option could be combined with institutional controls to achieve the RAOs.

In situ solidification

Description

In situ solidification (ISS) involves using mechanical equipment to introduce solidifying agents, such as cement or fly ash, into the subsurface to immobilize contaminants and NAPL. This can be accomplished using excavation equipment or a large diameter auger system. Given the small size of the site and limited amount of material affected it is likely it would be implemented using an excavator at the Penn Yan site. This process would be designed and controlled to produce a monolithic solidified mass. The permeability of this mass would be such that groundwater would be substantially unable to penetrate it. Following implementation of ISS, groundwater would be diverted away from areas where COC and Coal tar are present. Implementation of ISS can be a good choice to address the source of COC to groundwater in situations where there are large quantities of highly impacted materials located at significant depths or in the locations where access is difficult.

Effectiveness

Solidifying soil containing COC and coal tar limits contact between groundwater and contaminated soil and immobilizes COC. It can be effective in meeting RAOs for NAPL and for controlling the source of groundwater contamination and preventing migration. Although it does not reduce concentrations of COC, it would meet RAOs for prevention of ingestion, but would not prevent direct contact or inhalation. This technology does not provide treatment. Implementation using excavation equipment has the potential to lead to problems with dust generation. In addition, use of additive materials such as cement will lead to thermal reactions which may cause problems with vapors and odors.

Implementability

ISS is an available environmental technology that has been widely implemented at MGP sites. Implementation of ISS will lead to an increase in the volume of impacted material. Generally, this will mean that significant quantities of soil will require off-site management.

Evaluation

Given the fact that the implementation of ISS will not address the RAO for prevention of exposures to COC in groundwater and the fact that there is a limited amount of subsurface material acting as a source of COC, this technology is not retained for further evaluation.

In situ Bio-remediation

Description

In situ bioremediation provides treatment for COC by optimizing subsurface conditions to support the growth of microorganisms which are capable of metabolizing organic compounds, including VOCs and PAHs. For non-chlorinated compounds such as those at the site, this is typically accomplished by adding oxygen and nutrients, which the microorganisms require to live and reproduce. Sometimes specially produced microorganisms are injected to further enhance biodegradation, although generally naturally occurring organisms are used.

Oxygen, nutrients, and microorganisms can be added by injecting them using permanently installed wells or temporary wellpoints. Oxygen can also be provided by installing oxygen diffusers in permanent wells. A network of wells or wellpoints are installed in a spacing determined based on the characteristics of the subsurface soil and the materials and equipment being used. It is not unusual for injection points to be installed at a spacing of 10 to 15 feet.

Effectiveness

In-situ bioremediation may be effective in treating organic constituents, including PAHs, when concentrations of COC are low or moderate. It is not effective in treating areas with heavy staining, sheens, high concentrations of COC, or NAPL. Under the right conditions, it could be effective in meeting the RAOs for preventing exposures to COC in groundwater. It would not normally be expected to address NAPL or materials which provide a source of COC to groundwater. Bioremediation is most effective against low molecular weight compounds such as VOCs and naphthalene.

Implementability

Implementation of in-situ bioremediation is accomplished using drill rigs, injection wells, direct push rigs and other common equipment. Proprietary mixtures of oxygen releasing chemicals and nutrients and equipment capable of diffusing oxygen into the subsurface are commonly available and widely used.

Evaluation

Bioremediation is not expected to be an effective technology for meeting RAOs at the Penn Yan site. In some locations, concentrations of COC are higher than optimal levels for the technology and NAPL is present. This technology is not retained for further evaluation.

In situ chemical oxidation

Description

In situ chemical oxidation (ISCO) involves injection of chemical oxidants into the contaminated media to treat COC. ISCO can be utilized to treat COC in both subsurface soil and groundwater. Typical oxidants are Fenton's reagent, sodium persulfate, and potassium permanganate; however, the actual chemical oxidant would be evaluated during a pilot and/or bench test. Typically, the oxidant is applied as a liquid and delivered to the subsurface through a series of injection points/wells. ISCO may be a good choice in situations where subsurface soils have a medium to high permeability and where access for excavation is restricted by depth or obstruction.

Effectiveness

ISCO can be very effective in treating organic COC in situ. The technology is most effective in situations where concentrations of COC are moderate. When the concentration is low, the technology is not cost effective. When the concentrations are too high or when there are significant quantities of NAPL, it may not be effective without multiple injection events. Different oxidants may be effective against different contaminants. For that reason, treatability testing would be required during a pre-design investigation.

Implementability

Chemical oxidation could be applied to the groundwater table using injection wells. Addition of the oxidant to the groundwater may temporarily increase the solubility and mobility of COC and cause an increase in the extent of the dissolved phase plume. One of the primary difficulties with implementation of ISCO can be making sure that oxidants reach locations in the subsurface where COC are found. In addition, there can be significant health and safety and environmental concerns with ISCO since some of the oxidants are highly reactive.

Evaluation

ISCO is not considered a good choice for use at the Penn Yan site. Concentrations of COC in some areas may be too high and NAPL is present in some locations. Injection near the outlet, where impacted groundwater is found, may lead to mixing of oxidant with surface water.

Thermal Treatment

Description

Soil above and below the water table elevation are heated to thermally treat contaminants in soil using steam, electrical resistance, or electrical conduction. Steam injection wells or electrodes are used to provide the source of heat. In order to be effective, wells or electrodes would have to be installed about 10 feet apart. Steam from a portable boiler or electricity from a generator are used to generate heat. A soil vapor extraction (SVE) system is used in conjunction with heating to collect any vapors generated.

Effectiveness

This technology could be effective in meeting RAO for removing the source of COC to groundwater and prevent exposure to COC. It would provide effective treatment.

Implementability

This technology is generally considered implementable. Because of high costs for mobilization, this technology is considered most implementable for large quantities of moderate to high concentrations of COC. There are a limited number of contactors who provide thermal treatment. Implementing thermal technology next to the outlet may be difficult because it may not be possible to achieve high enough temperatures.

Evaluation

In situ thermal treatment is not considered a good choice for use at Penn Yan because of difficulties with implementation for sites with limited quantities of material with high concentrations of COCs. This technology is not retained for additional evaluation.

4.3.1.4 Removal

Removal remedies for groundwater provide protection to human and environmental receptors by removing the source of COC to groundwater, or by removing the impacted groundwater. Removal technologies are used in combination with on-site and/or off-site management technologies.

Excavation

Description

Implementation of this remedial technology would require removal and dewatering of subsurface soil, and NAPL which contribute to groundwater contamination. Subsurface soils and NAPL would be excavated to depths up to about 8 feet bgs. The groundwater table ranges is found at a depth of about 5 feet over most of the site. Excavation below groundwater and to these depths will require the use of a standard excavation equipment and the installation of temporary watertight sheet piling. Sheeted excavations would require internal or external bracing to ensure that nearby structures are not damaged due to deflections and/or settlement and to protect the outlet. Excavation below the water table would require dewatering. Water treatment plant and discharge technologies would be utilized during construction. Any remedial alternative that includes this technology would have to include additional on-site or off-site waste management technologies such as treatment and/or disposal.

Effectiveness

Excavation is one component of a potentially effective soil and groundwater remedy that would also include on-site or off-site treatment or disposal. The remedy would achieve the RAOs for addressing NAPL and for removal of the source of groundwater contamination. This technology will permanently reduce concentration, toxicity, mobility, and volume of NAPL and COC. Short-term risks would result from disturbing impacted surface soil and by exposing subsurface soil. Safe work practices would be required during excavation in order to mitigate exposure risks to construction workers. No long-term maintenance would be required with this technology.

Implementability

Given the relatively shallow depths and open areas for excavation at the site, excavation will be readily implementable.

Evaluation

Excavation is retained because it would provide a permanent remedy when performed in conjunction with on-site or off-site treatment or disposal.

4.3.1.5 Groundwater Treatment and Discharge

Any remedial alternative which includes excavation dewatering will also require treatment and discharge of the extracted groundwater.

Organic treatment

Description

Organic water treatment would be required for use in conjunction with groundwater removal technologies. A number of technologies are available for the treatment of VOCs and SVOCs in groundwater including the following:

- air stripping (VOCs only)
- granular activated carbon (GAC)
- chemical/UV oxidation
- aerobic biological treatment (VOCs only)
- oil-water separator
- filtration

The organic treatment process would be used as part of a treatment train to treat groundwater removed from excavation areas.

Effectiveness

This technology would be effective at meeting the RAOs for prevention of exposure to COCs in groundwater.

Experience at similar MGP sites with organic constituents in groundwater have shown that all of these technologies except air stripping are capable of meeting stringent discharge standards. Air stripping would not be effective for SVOCs. The selection of the most cost-effective approach to groundwater treatment will depend on the final design configuration and discharge criteria.

Implementability

Systems for treatment of organic COC in extracted groundwater are readily constructed and operated. Provisions for discharge of treated groundwater would have to be made.

Evaluation

Organic groundwater treatment is retained because it has been proven effective in treating organic COC in collected groundwater to water quality standards and because it would be needed in order to implement excavation dewatering.

Inorganic treatment

Description

Inorganic treatment would be required for use in conjunction with groundwater technologies. A number of technologies are available for the treatment of inorganic parameters, including cyanide, in groundwater including the following:

- chemical precipitation
- ion exchange/adsorption
- filtration
- sequestration
- peroxide addition

The inorganic treatment process would be used as part of a treatment train to treat groundwater removed from excavation areas.

Effectiveness

This technology would be effective at meeting the RAOs for prevention of exposure to COCs in groundwater.

Experience at similar MGP sites with inorganic constituents in groundwater have shown that these technologies are capable of meeting stringent discharge standards. The selection of the most cost-effective approach to groundwater treatment will depend on the final design configuration and discharge criteria.

Implementability

Systems for treatment of inorganic COC in extracted groundwater are readily constructed and operated. Provisions for discharge of treated groundwater would have to be made.

Evaluation

Inorganic groundwater treatment is retained because it has been proven effective in treating inorganic COC in water generated during excavation dewatering to water quality standards and will be required in order to implement excavation dewatering.

Discharge to POTW

Description

Impacted groundwater would be extracted during remedial action and piped into the sanitary sewer system either directly or after undergoing pretreatment. The viability of this option would be dependent on approval by the Publicly Owned Treatment Works (POTW), which would establish maximum acceptable effluent concentrations for COC. Also, a maximum daily discharge volume would be dictated, and discharge would have to be metered.

Effectiveness

Discharging to the POTW could be one component of an excavation dewatering remedy. Because any groundwater that is removed is subject to water quality standards, it must undergo treatment prior to discharge. If not pretreated at the site, groundwater would be effectively treated at the POTW, where COC would be removed both physically during sedimentation and biologically during aerobic degradation processes.

Implementability

Discharging extracted groundwater into the sanitary sewer system would be easily implemented with the cooperation of the Penn Yan Municipal Board. Appropriate piping as well as metering and sampling ports would be required, but could easily be obtained and installed. Administrative coordination and permitting would be necessary to receive approval for discharge and to demonstrate compliance with discharge requirements over time.

Evaluation

This alternative is retained because it will treat groundwater to water quality standards. This technology may be required in order to implement excavation remedy

Discharge to surface water

Description

With this technology, treated water from the site would be discharged directly to the nearest surface water body, the Keuka Lake outlet. A discharge pipe would have to be constructed from the treatment system effluent to the outlet. This would require a State Pollutant Discharge Elimination System (SPDES) permit to be issued by the NYSDEC. The SPDES permit would include provisions for discharge limitations, including chemical concentrations and daily discharge rates.

During operation, constituent concentration and flow monitoring would be required, consistent with the provisions of the NYSDEC SPDES permit to demonstrate that treated water meets discharge requirements. The discharge requirements under a SPDES permit are typically more stringent than for discharge into a POTW.

Effectiveness

This option would be effective for the management of impacted groundwater when included in a system including groundwater recovery, effective treatment, and discharge.

Implementability

There are some difficulties associated with the implementation of this technology including obtaining an NYSDEC SPDES permit for discharge and meeting the more stringent discharge requirements.

Evaluation

This alternative is retained because it will help in the management of treated groundwater, although it does not directly achieve the RAOs for groundwater.

4.3.1.6 Containment

Biological containment

Description

For this technology, containment is provided by installing air sparging wells or oxygen injection points around areas identified as sources of contamination to groundwater. Contaminants in groundwater are treated by in situ bioremediation. This technology treats contaminated water before it migrates off-site by enhancing natural attenuation processes that are already taking place in the aquifer.

Effectiveness

Biological containment is potentially effective in meeting the RAO to prevent off-site migration of COC in groundwater. Given the location of NAPL and the source of groundwater impacts immediately next to the outlet this technology is likely to have limited effectiveness at the Penn Yan site. It would not be effective to meet the RAOs for preventing ingestion, direct contact or inhalation of groundwater; restoring the groundwater aquifer; removing the source of groundwater impact, or addressing NAPL.

Implementability

Implementation of this technology would require installation of injection wells and a low volume air injection system. Both of these activities would readily available technologies.

Evaluation

Because of its limited effectiveness in meeting RAOs, this technology is not retained for further evaluation.

Permeable reactive barrier

Description

In order to implement this technology, treatment chemicals potentially including zero valent iron, carbon, or organoclay would be mixed with permeable soil in order to form a barrier to treat COC in groundwater before it can migrate outside of areas where impacted groundwater is found. If site soils are sufficiently permeable, mixing can be accomplished using excavators or augers to mix the materials in place. Alternatively, treatment chemicals can be mixed with sand and then put in place using slurry wall technology or shoring.

Effectiveness

A permeable reactive barrier is potentially effective to prevent off-site migration of COC in groundwater. It would not be effective to meet the RAOs for preventing ingestion, direct contact or inhalation of groundwater; restoring the groundwater aquifer; removing the source of groundwater impact; or prevention of migration of NAPL.

Implementability

Implementation of this technology would require excavation of a trench and backfilling with soil mixed with treatment chemicals. This could be accomplished using excavations and shoring or trenching technology both of which are generally available.

Evaluation

Because of its limited effectiveness in meeting RAOs, this technology is not retained for further evaluation.

Physical containment/cutoff wall

Description

This technology would make use of a low permeability sheet pile wall around the perimeter of the area where impacted groundwater is found. The cut-off wall would isolate the contaminants from the surrounding aquifer, preventing groundwater with concentrations of COC greater than remedial action criteria from leaving the site. Given the limited area at the site where groundwater is impacted it is likely that clear groundwater from upgradient will migrate around the wall without the need for a groundwater extraction system.

Effectiveness

Cutoff walls are a well proven containment technology. The wall itself must be designed to inhibit the lateral flow of groundwater. The effectiveness of a cutoff wall is dependent not only on the physical/hydraulic properties of the wall, but also on the hydrogeologic conditions present at the site. The base of the containment system would be sealed by keying the wall into the low permeability silt layer present at the Penn Yan site, essentially eliminating any groundwater flow beneath the wall. Cut off walls are especially effective in preventing migration of NAPL. Because of the limited and discontinuous distribution of NAPL, this technology is not expected to be effective in meeting RAOs

for NAPL. A cutoff wall would not be effective in meeting RAOs for prevention of direct contact, ingestion or inhalation of COC in groundwater and would not provide treatment.

Implementability

Barrier wall construction is performed routinely, with readily available equipment and subcontractors. Steel sheet piles with hydrophilic interlock sealant could be used. Steel sheet pile cutoff walls could be readily implemented at this site.

Evaluation

Because of its limited effectiveness in meeting RAOs , this technology is not retained for further evaluation.

4.3.2 Surface soil

4.3.2.1 No action

Description

The No Action technology for surface soil includes no further efforts at the site to reduce concentrations of COC in the surface soils to meet the RAOs, or to reduce exposure pathways to impacted surface soil. No further monitoring would be performed and no access restrictions would be implemented. Evaluation of this technology is required as a baseline to which other remedial technologies can be compared.

Effectiveness

This technology is not considered effective because it would not achieve any the site's RAOs. No Action would not reduce or eliminate exposure pathways (e.g., dermal contact, incidental ingestion, inhalation of dust or volatilized constituents) to COC in the surface soil. The alternative would not reduce the concentration, toxicity, mobility, or volume of COC.

Implementability

Since no activities would be occurring on the site, this option would be easily implemented.

Evaluation

The No Action option is retained for use as a comparison tool for other remedial technologies.

4.3.2.2 Institutional/engineering controls

Institutional and engineering controls achieve their effect by preventing human or environmental exposure to COC using administrative or physical restrictions on behavior. Institutional controls are typically legal or institutional restrictions regarding site access or use. Engineering controls prevent exposure by eliminating physical access to the contaminants.

Environmental easement

Description

As described in Section 4.3.1.2, an environmental easement is a restriction attached to the title of a property to restrict certain activities or uses at the site. This technology would require inspections to

ensure that all restrictions are being followed. Restrictions may also be utilized to ensure that other elements of the selected remedy, such as fences and surface caps, remain intact.

An easement can be used to implement a SMP which is a document which describes anticipated future work related to the site, including monitoring, inspections, reporting, and operation and maintenance.

Effectiveness

An environmental easement alone would not achieve the RAOs for surface soil. It would not provide protection from exposures to on-site workers for incidental dermal contact, ingestion, or inhalation exposures to COC. An environmental easement does nothing to reduce the concentration, toxicity, mobility, or volume of COC in the surface soil.

An environment easement may be effective in meeting RAOs for surface soil when implemented in conjunction with an engineering control, such as a fence or a containment system such as a soil cover. An SMP enforced by an environmental easement requiring ongoing inspection and maintenance would be required in order for an engineering control to be considered effective.

Implementability

This option is easily implemented with approval from the NYSDEC.

Evaluation

This option is retained because of its potential effectiveness in combination with other technologies (*e.g.,* containment and engineering controls).

Fencing

Description

In order to implement this technology, fencing is installed around portions of the site where COCs are present above remedial criteria in surface soil. This prevents casual contact with the soil and exposure. Chain-link fencing, at least six feet high with locking gates is typically used.

Effectiveness

Fencing is typically used to prevent exposures by casual by-passers and trespassers, but these were not identified as significant receptors at the site. The most likely exposure is to site workers, but fencing will not prevent that exposure.

Implementability

Installation of chain-link fencing is a very common site improvement activity performed by local contractors using easily available materials. Implementation of an environmental easement would be necessary to provide for maintenance of the fence.

Evaluation

This technology is not retained for further evaluation.

4.3.2.3 Removal

Removal remedies for surface soil provide protection to human and environmental receptors by removing COC from locations where exposures can take place. Removal technologies are used in combination with on-site or off-site management technologies. Excavation will be the only removal technology considered for surface soils.

Excavation

Description

Implementation of this remedial technology would require removal of surface soils identified as contributing to unacceptable risk. Soils would be excavated to a depth of 12 inches with an excavator, and then backfilled with clean material. Maintenance requirements for the backfilled excavations may be the same as for a surface soil cover. Any remedial alternative that includes this technology would also have to include additional on-site or off-site waste management technologies such as treatment and/or disposal.

Effectiveness

Excavation is one component of a potentially effective surface soil remedy that would also include off-site treatment or disposal. The remedy would achieve the RAOs for prevention of ingestion and direct contact with surface soils and inhalation of contaminants in surface soil, and permanently reduce concentration, toxicity, mobility, and volume of COC. Management would be required during implementation to minimize this exposure to construction workers.

Implementability

Excavation is an easily implemented option. Because only the top 12 inches of soil would be excavated, complications such as dewatering, shoring, and slope stability that are often encountered with deeper excavations will not be of concern.

Evaluation

Excavation is retained because it would provide a permanent remedy when performed in conjunction with treatment or disposal and surface cover. Excavation is necessary for the implementation of other technologies.

4.3.2.4 Containment

Containment remedies for surface soil provide protection by preventing human and environmental exposure using a physical barrier. Barriers can prevent direct contact with COC and also prevent migration of COC in surface water or as dust.

Soil cover

Description

To implement this technology, surface soil areas that pose a risk to onsite workers and trespassers would be covered with a layer of topsoil and/or gravel to provide a barrier against direct human contact with COC. Implementation of this technology would also require site grading, storm water runoff management, seeding, and maintenance of the surface cover and its vegetation. Maintenance requirements for the soil cover would include scheduled inspections, mowing and fertilizing of the grass, reseeding of areas where the grass dies, and repair of erosion damage. A SMP would address

maintenance and inspection of the soil cover. An environmental easement may be utilized to prevent excavation and/or disturbance of the cap.

Effectiveness

When maintained properly, a soil cover would prevent direct contact with COC in soil. Once construction is completed, this option would meet the RAOs for surface soil by preventing exposures to onsite workers and trespassers through dermal contact, ingestion, and/or dust inhalation. A regularly maintained soil cover in conjunction with institutional and engineering controls (*e.g.,* environmental easements and fencing) to prevent future disruption of the cap would provide suitable long-term protection.

Implementability

Placing a soil cover over the impacted surface soil is easily implemented. The equipment and workers necessary to perform this task are readily available. The administrative coordination necessary to implement this option is not substantial. Ongoing maintenance would be required, but would be limited in scope, coordination, and cost. As previously mentioned, additional long-term protection could be improved by combining this option with institutional controls. Construction of a soil cover will have a limited impact on redevelopment onsite.

In order for a soil cover to be implementable at the Penn Yan site, it is likely to be necessary to excavate soil in order to maintain site grades and elevations. In that case, the soil cover technology is no different from excavation and backfill.

Evaluation

Because a soil cover is easy to implement and effective in preventing exposure, it is retained as a technology for surface soils.

Asphalt pavement

Description

An asphalt pavement cap would be installed by placing standard asphalt pavement consisting of subbase, a base course, and a wearing course over areas of impacted surface soil. Because loads on the pavement will be small, the thickness of the pavement can be minimized. Regular maintenance of the cap would be required, including periodic sealing and repair of cracks.

Effectiveness

When maintained properly, an asphalt cap would prevent direct contact with COC in soil. Once construction is completed, this option would meet the RAOs for surface soil by preventing exposures to onsite workers and trespassers through dermal contact, ingestion, and/or dust inhalation. A regularly maintained cap in conjunction with institutional and to prevent future disruption of the cap would provide suitable long-term protection.

Implementability

Placement of an asphalt pavement cap is easily implementable using readily available equipment and contractors.

Evaluation

Installation of an asphalt pavement cap is considered equivalent to a soil cover in terms of implementability and effectiveness. Although it will not be evaluated further in this FS, it may be considered during design if a capping alternative is selected.

4.3.2.5 Off-site disposal or treatment

Landfill disposal

Description

Landfill disposal refers to the off-site transportation and permanent disposal of soils at an approved non-hazardous waste landfill. Soils that contain low concentrations of COC may be disposed at a landfill; however, MGP wastes which do not meet regulatory limits for the toxicity characteristic for benzene require thermal treatment (refer to Thermal Desorption section below).

Effectiveness

In conjunction with excavation, which is required for implementation, landfill disposal will be effective in meeting the RAOs for surface soil containing low levels of contaminants.

Precautions must be taken during excavation and transportation to prevent exposures to site workers or off-site migration of constituents in dust or tracked soil. These issues can be addressed with careful management during construction.

Implementability

Landfill disposal of waste generated at the site would be easily implemented. Excavation and off-site disposal is a commonly selected remedy for MGP sites in New York State with low concentrations of COC. There are multiple permitted non-hazardous landfill facilities located within a reasonable distance from the Penn Yan MGP site.

Evaluation

Landfill disposal is retained for further consideration as an adjunct to excavation.

Thermal desorption

Description

Thermal desorption refers to the volatilization of chemical constituents adsorbed to soil and other solid material with heat. In general, soils containing less than 2 percent organic contamination and 20 percent moisture are well suited to treatment using direct-fired equipment. Thermal desorption facilities typically accept soil with particles of less than 4-6 inches, and reduce the size of the material further (to under 2 inches) to meet the mechanical limitations of the treatment equipment. For that reason thermal treatment facilities may also be used for management of some impacted debris.

Soils that are thermally treated off-site may be reused as backfill on the site or put to other beneficial use, making this option more sustainable than landfill disposal. NYSDEC policy DER-4, "*Management of Coal Tar Waste and Coal tar Contaminated Soils and Sediment from Former Manufactured Gas Plants*" (NYSDEC, 2002) requires thermal treatment of MGP wastes which do not meet regulatory limits for the toxicity characteristic for benzene.

Effectiveness

In conjunction with excavation, which is required for implementation, thermal desorption will be effective in meeting the RAOs for surface soil. The organic COC at the site should be effectively treated using thermal desorption. Historical data from treatment of contaminated soils at similar sites have demonstrated reductions of greater than 99% for individual BTEX and PAH constituents.

Precautions must be taken during excavation and transportation to prevent exposures to site workers or off-site migration of constituents in dust or tracked soil. These issues can be addressed with careful management during construction.

Implementability

Off-site thermal desorption of waste generated at the site would be easily implemented. Excavation and off-site thermal desorption is a commonly selected remedy for MGP sites in New York State. There are multiple permitted thermal desorption facilities located within a reasonable distance from the Penn Yan MGP site.

Evaluation

Off-site thermal desorption is retained for further consideration as an adjunct to excavation.

4.3.3 Subsurface soil

4.3.3.1 No action

Description

The No Action technology would require no further efforts to reduce concentrations of COC in the subsurface soils. No Action would involve leaving the site “as-is”, without implementing any remedial techniques to meet RAOs. No further monitoring would be performed and no access restrictions would be implemented. Evaluation of this technology is required as a baseline to which other remedial technologies can be compared.

Effectiveness

This technology would not achieve any of the site’s RAOs and is therefore not considered effective. No Action would not reduce or eliminate exposure pathways (e.g., dermal contact, incidental ingestion) to COC in the subsurface soil. The alternative would not reduce the concentration, toxicity, mobility, or volume of COC.

Implementability

Since no activities would be occurring on the site, this option would be easily implemented.

Evaluation

The No Action option is retained for use as a comparison tool for other remedial technologies.

4.3.3.2 Institutional Controls

Environmental easement

Environmental easements are provisions that accompany the title of a property to restrict certain activities, such as excavation and other intrusive activities. This technology would require monitoring

and site inspections to ensure that all environmental easements are being followed. Environmental easements may also be utilized to ensure that other elements of the selected remedy remain intact, such as fences and soil cover.

An easement can be used to implement a SMP which is a document which describes anticipated future work related to the site, including monitoring, inspections, reporting, and operation and maintenance.

Effectiveness

An environmental easement and a SMP would meet the RAOs for prevention of onsite ingestion of and direct contact with contaminated subsurface soil and inhalation of volatiles from impacted subsurface soil, because it would control access and exposure to subsurface soils on the site. The environmental easement and SMP do not reduce the concentration, toxicity, mobility, or volume of COC in subsurface soils.

Implementability

This option is easily implemented with approval from NYSDEC.

Evaluation

This option is retained because of its potential effectiveness in combination with other technologies.

4.3.3.3 Removal

Excavation is the only considered removal option for subsurface soils.

Excavation

Description

As discussed in Section 4.3.1.4, implementation of this remedial technology would require removal and dewatering of subsurface soils down to a depth of 8 feet.

Effectiveness

Excavation is one component of a potentially effective subsurface soil remedy that would also include on-site or off-site treatment or disposal. The remedy would achieve the RAOs for prevention of direct contact, inhalation, and ingestion of COC and will permanently reduce concentration, toxicity, mobility, and volume of COC. Short-term risks would result from disturbing impacted subsurface soil. Careful work practices would be required during excavation in order to mitigate exposure risks to construction workers. No long-term maintenance would be required with this technology.

Implementability

Typically, excavation is an easily implemented option at MGP sites. In order to implement it at the Penn Yan site, installation of shoring will be required to protect the site building and the street.

Evaluation

Excavation is retained because it would provide a permanent remedy when performed in conjunction with off-site treatment or disposal.

4.3.3.4 In situ treatment

In situ solidification

Description

A description of this ISS technology is presented in Section 4.3.1.3.

Effectiveness

In situ treatment of impacted soils using the ISS method will not reduce concentrations of COC in subsurface soil. For that reason, it does not achieve RAOs for prevention of direct contact, inhalation, and ingestion of COC in subsurface soil.

Implementability

ISS is an available environmental technology that has been widely implemented at MGP sites. Implementation of ISS will lead to an increase in the volume of impacted material. Generally, this will mean that significant quantities of soil will require off-site management.

Evaluation

ISS will not address RAOs for prevention of exposure of COC in subsurface soil and has significant implementability issues. For that reason, it is not retained for further evaluation.

In Situ Bioremediation

Description

As discussed in Section 4.3.1.3, In Situ Bioremediation uses naturally occurring microorganisms to degrade COC in soil.

Effectiveness

In-situ bioremediation may be effective in treating organic constituents, including PAHs, when concentrations of COC are low or moderate. It is not effective in treating areas with heavy staining, sheens, or high concentrations of COC. Under the right conditions, it could be effective in meeting the RAOs for preventing exposures to COC in subsurface soil. Bioremediation is most effective against low molecular weight compounds such as VOCs and naphthalene.

Implementability

Implementation of in-situ bioremediation is accomplished using drill rigs, injection wells, direct push rigs and other common equipment. Proprietary mixtures of oxygen releasing chemicals and nutrients and equipment capable of diffusing oxygen into the subsurface are commonly available and widely used.

Evaluation

Bioremediation is not expected to be an effective technology for meeting RAOs for subsurface soil at the Penn Yan site. In some locations, concentrations of COC are higher than optimal levels for the technology. This technology is not retained for further evaluation.

In Situ Chemical Oxidation

Description

As discussed in Section 4.3.1.3, ISCO involves the introduction of chemical oxidants into the contaminated media to chemically treat and reduce concentrations of COC in subsurface soil.

Effectiveness

ISCO can be very effective in treating organic COC in situ. The technology is most effective in situations where concentrations of COC are moderate. When the concentration is low, the technology is not cost effective. When the concentrations are too high or when there are significant quantities of NAPL, it may not be effective without multiple injection events. Different oxidants may be effective against different contaminants. For that reason, treatability testing would be required during a pre-design investigation.

Implementability

Chemical oxidation could be applied to subsurface soil using injection wells. Addition of oxidant may temporarily increase the solubility and mobility of COC and cause an increase in the concentration of COCs in groundwater. One of the primary difficulties with implementation is ISCO can be making sure that oxidants reach locations in the subsurface where COC are found. In addition, there can be significant health and safety and environmental concerns with ISCO since some of the oxidants are highly reactive. Implementation of ISS will lead to an increase in the volumes of impacted material. Generally, this will mean that significant quantities of soil will require off-site management.

Evaluation

ISCO is not considered a good choice for use at the Penn Yan site. Concentrations of COC in some areas may be too high. Injection near the outlet, where impacted groundwater is found, may lead to mixing of oxidant with surface water.

Thermal Treatment

Description

Soil above and below the water table elevation are heated to thermally treat contaminants in soil using steam, electrical resistance, or electrical conduction. Steam injection wells or electrodes are used to provide the source of heat. In order to be effective, wells or electrodes would have to be installed about 10 feet apart. Steam from a portable boiler or electricity from a generator are used to generate heat. A SVE system is used in conjunction with heating to collect any vapors generated.

Effectiveness

This technology could be effective in meeting RAO for removing the source of COC to groundwater and prevent exposure to COC. It would provide effective treatment.

Implementability

This technology is generally considered implementable. Because of high costs for mobilization, this technology is considered most implementable for large quantities of moderate to high concentrations of COC. There are a limited number of contactors who provide thermal treatment.

Implementing thermal technology next to the outlet may be difficult because it may not be possible to achieve high enough temperatures.

Evaluation

In situ thermal treatment is not considered a good choice for use at Penn Yan because of difficulties with implementation. This technology is not retained for additional evaluation.

4.3.3.5 Off-site disposal or treatment

Landfill disposal

Description

Landfill disposal refers to the off-site transportation and permanent disposal of soils at an approved non-hazardous waste landfill. Soils that contain low concentrations of COC may be disposed at a landfill.

Effectiveness

In conjunction with excavation, which is required for implementation, landfill disposal will be effective in meeting the RAOs for subsurface soil containing low levels of contaminants.

Implementability

Landfill disposal of waste generated at the site would be easily implemented. Excavation and off-site disposal is a commonly selected remedy for MGP sites in New York State with low concentrations of COC. There are multiple permitted non-hazardous landfill facilities located within a reasonable distance from the Penn Yan MGP site. Precautions must be taken during transportation to prevent exposures to site workers or off-site migration of constituents in dust or tracked soil. These issues can be addressed with management during construction.

Evaluation

Landfill disposal is retained for further consideration as an adjunct to excavation.

Thermal desorption

Description

As described in Section 4.3.2.5, thermal desorption refers to the treatment of soil in a permitted off-site thermal treatment facility. NYSDEC policy DER-4 requires thermal treatment of MGP wastes which do not meet regulatory limits for the toxicity characteristic for benzene.

Effectiveness

In conjunction with excavation, which is required for implementation, thermal desorption would be effective in meeting the RAOs for subsurface soil. The organic COC at the site should be effectively treated using thermal desorption. Precautions must be taken during excavation and transportation to prevent exposures to site workers or off-site migration of constituents in dust or tracked soil. These issues can be addressed with careful management during construction.

Implementability

Off-site thermal desorption of waste generated at the site would be easily implemented. Excavation and off-site thermal desorption is a commonly selected remedy for MGP sites in New York State. There are multiple permitted thermal desorption facilities located within a reasonable distance from the Penn Yan MGP site.

Evaluation

Off-site thermal desorption is retained for further consideration as an adjunct to excavation.

4.3.4 Sediment

4.3.4.1 No action

Description

The No Action technology for the Keuka Lake outlet sediments includes no further efforts at the site to reduce concentrations of COC in the sediments or to reduce exposure pathways to impacted sediments to meet the RAOs. No further monitoring would be performed and no access restrictions would be implemented. Evaluation of this technology is required as a baseline to which other remedial technologies can be compared.

Effectiveness

This technology is not considered effective because it would not achieve any the site's RAOs. No Action would not reduce or eliminate exposure pathways (e.g., dermal contact or incidental ingestion) to COC in the sediments. The alternative would not reduce the concentration, toxicity, mobility, or volume of COC.

Implementability

Since no activities would be occurring on the site, this option would be easily implemented.

Evaluation

The No Action option is retained for use as a comparison tool for other remedial technologies.

4.3.4.2 Monitored natural recovery

Description

Monitored natural recovery (MNR) is a sediment cleanup method that uses naturally occurring processes to contain, destroy or otherwise reduce the bioavailability or toxicity of contaminants in sediment. MNR involves long-term monitoring to document contaminant weathering, covering by additional deposition, and progress toward the remedial objective. MNR is often used in conjunction with cleanup methods that remove or control significant contaminant sources.

Depending on the contaminants and sediment environment, risk reduction may occur when: exposure levels are reduced by a decrease in the contaminant concentrations in the near-surface zone through burial or mixing with cleaner sediment; the contaminant is converted to a less toxic form through destructive processes, such as biodegradation or abiotic transformations; and/or contaminant mobility and bioavailability are reduced through increased sorption to the sediment matrix.

Effectiveness

MNR is most effective in providing treatment for COC in sediment at low to moderate concentrations. If there are significant areas with higher concentrations, removal or containment of those areas is likely to be necessary in order for MNR to work. MNR is potentially effective in meeting the RAO for prevention of impacts to benthic organisms. It may also provide limited treatment of COC.

Implementability

MNR may be used in conjunction with contaminated sediment removal in areas with heavier impacts adjacent to the site.

Evaluation

This option is retained for further evaluation due to its potential effectiveness in achieving the RAO for sediment in areas with relatively low concentrations of COC.

4.3.4.3 Removal

Removal remedies for sediments provide protection to human and environmental receptors by removing COC from locations where exposures can take place. Removal technologies are used in combination with on-site or off-site management technologies.

Excavation/dredging

Description

Excavation is a method of removing contaminated sediment from a water body after the water has been diverted or drained. Excavation of contaminated The Keuka Lake outlet sediments would involve isolating the contaminated sediment from the water body, pumping or diverting water from the area, and managing any continuing inflow. Sediment excavation would be performed using conventional equipment. Prior to pumping out water, the remediation area would be isolated using sheet piling or earthen dams.

Similar to excavation, dredging is a frequently used method for remediation of contaminated sediments. Dredging is performed under water and involves mechanical or hydraulic techniques to dislodge impacted sediment. Once dislodged, the sediment may be removed using either mechanical (with buckets) or hydraulic (by pumping) methods. Dredging requires dewatering and transportation of the sediment to a location for treatment and/or disposal. Water collected from the dewatered sediment would also require treatment prior to discharge.

Excavation or dredging of contaminated sediments would provide protection by removing COC from locations where exposures could take place. Removal technologies are used in combination with on-site or off-site management technologies.

Effectiveness

Excavation/dredging is one component of a potentially effective shallow sediment remedy that would also include on-site or off-site treatment or disposal. The remedy would permanently reduce concentration, toxicity, mobility, and volume of COC and would help meet the RAOs for prevention of human and environmental exposures. Short-term risks would result from disturbing impacted sediment. Careful management would be required during implementation to minimize this exposure to construction workers. No long-term maintenance would be required with this technology.

Implementability

Removal of sediment impacted with COC will be effective in meeting RAOs for preventing human and environmental exposures and restoring sediment to background conditions. If this technology is used in conjunction with management at a thermal treatment facility, this technology will provide significant treatment.

Evaluation

Excavation or dredging is retained because it would provide a permanent remedy when performed in conjunction with on-site or off-site treatment or disposal.

4.3.4.4 Containment

Subaqueous Cap

Description

In Situ capping is a technology used to prevent human and environmental contact with impacted sediment and to prevent off-site migration caused by erosion. This technology would be implemented in The Keuka Lake outlet by placing a layer of sand as a physical barrier. It may be necessary to place a layer of gravel or stone to provide armoring to keep the cap from eroding. It might also be necessary to excavate sediment from the bottom of the outlet in order to maintain the existing bottom elevation.

In areas where there are significant quantities of NAPL, cap material with lower permeability can be used to prevent migration through the caps. Methods for constructing low permeability caps below the water surface have been developed.

Effectiveness

Capping would be potentially effective in meeting the RAO for prevention of ingestion, direct contact, or inhalation of COC in sediment and preventing contract between COC and benthic organisms.

Implementability

Subaqueous capping is implementable in the Keuka Lake outlet. In order to maintain the bottom elevation of the Keuka Lake outlet, it will be necessary to dredge or excavate sediment prior to placement.

Evaluation

Subaqueous capping is a potentially effective technology for addressing RAOs for sediment and is retained for further evaluation.

4.3.4.5 Off-site disposal or treatment

Landfill disposal

Description

Landfill disposal refers to the off-site transportation and permanent disposal of sediments at an approved non-hazardous waste landfill. Sediments that contain low concentrations of COC may be disposed at a landfill. Sediment dewatering on-site or off-site may be required.

Effectiveness

In conjunction with excavation or dredging, which is required for implementation, landfill disposal will be effective in meeting the RAO for sediment containing low levels of contaminants.

Implementability

Landfill disposal of waste generated during sediment removal would be easily implemented. Excavation and off-site disposal is a commonly selected remedy for MGP sites in New York State with low concentrations of COC. It is likely that dewatering of sediment by mixing with admixture materials or using other methods will be necessary to meet facility acceptance criteria. There are multiple permitted non-hazardous landfill facilities located within a reasonable distance from the Penn Yan MGP site.

Precautions must be taken during removal and transportation to prevent exposures to site workers or off-site migration of constituents in dust or tracked sediment. These issues can be addressed with careful management during construction.

Evaluation

Landfill disposal is retained for further consideration as an adjunct to excavation or dredging.

Thermal desorption

Description

As described in Section 4.3.2.5, thermal desorption refers to the treatment of soil in a permitted off-site thermal treatment facility. NYSDEC policy DER-4 requires thermal treatment of MGP wastes which do not meet regulatory limits for the toxicity characteristic for benzene.

Effectiveness

In conjunction with excavation or dredging, which is required for implementation, thermal desorption will be effective in meeting the RAO for sediment. The organic COC in sediment should be effectively treated using thermal desorption.

Implementability

Off-site thermal desorption of waste generated during sediment removal would be easily implemented. Excavation and off-site thermal desorption is a commonly selected remedy for MGP sites in New York State. There are multiple permitted thermal desorption facilities located within a reasonable distance from the Penn Yan MGP site. It is likely that dewatering of sediment by mixing with admixture materials or using other methods will be necessary to meet facility acceptance criteria

Precautions must be taken during removal and transportation to prevent exposures to site workers or off-site migration of constituents in dust or tracked sediment. These issues can be addressed with careful management during construction.

Evaluation

Off-site thermal desorption is retained for further consideration as an adjunct to excavation or dredging.

5.0 Development and detailed analysis of alternatives

DER-10 specifies that development and evaluation of remedial alternatives should be included as part of the remedy selection process. In Section 4, remedial technologies were identified for each media which are potentially capable of meeting the RAOs established in Section 3. In Section 4, selected technologies were then screened on a media-specific basis to determine those which are technically implementable and can meet the RAOs. In this section technologies identified previously will be combined into remedial alternatives potentially capable of achieving remedial goals and objectives. These alternatives will then be evaluated to provide a basis for the selection of a remedial action for the site.

5.1 Evaluation Criteria

The evaluation of alternatives is accomplished by evaluating each alternative in relation to nine specified criteria which include the following:

- Overall protection of human health and the environment – An evaluation of the remedy's ability to protect human health and the environment by assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through; removal, treatment, engineering controls, and/or institutional controls. The remedy's ability to achieve each of the RAOs will be evaluated.

- Compliance with SCGs – An evaluation of whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. SCGs for the site are listed in Tables 3-1, 3-2, and 3-3, which list chemical-specific, action-specific, and location-specific SCGs respectively as well as other documents which are to be considered (TBC) when evaluating remedial technologies.

- Long-term effectiveness and permanence – An evaluation of the long-term effectiveness of the remedy after implementation. Where wastes remain on-site; the magnitude of the remaining risks, adequacy of engineering and institutional controls intended to limit the risk, and the ability of the remedy to continue to meet RAOs in the future will be evaluated.

- Reduction of toxicity, mobility, and/or volume – An evaluation of the remedy's ability to reduce the toxicity, mobility and/or volume of site contamination through treatment.

- Short-term effectiveness – An evaluation of the potential short-term adverse impacts and risks of the remedy upon the community, workers and the environment during the construction and/or implementation. The length of time needed to achieve the remedial objectives will also be evaluated.

- Implementability – An evaluation of the technical and administrative feasibility of implementing the remedy. Technical feasibility includes the difficulties associated with construction and the ability to monitor the effectiveness of the remedy. Administrative feasibility will depend on the availability of the necessary personnel and materials along with any potential difficulties in obtaining specific operating approvals, access for construction, or permits.

- Cost Effectiveness – A remedy is cost effective if its costs are proportional to its overall effectiveness. To evaluate cost effectiveness, the overall effectiveness of an alternative or remedy is determined by evaluating its long- and short-term effectiveness and reduction in toxicity, mobility, or volume through treatment. A comparison of the overall effectiveness is then made to the cost of the alternative or remedy and an assessment is made as to whether the cost is proportional to the overall effectiveness, to determine whether it is cost effective.

Estimated costs are presented for the proposed remedies. These include capital and operations, maintenance, and monitoring (OM&M) costs. OM&M costs are presented as present worth costs calculated based on a period of 30 years with a discount rate of 7 percent. This value was selected based on recommendations included in USEPA FS costing guidance (EPA 2000). Costs have been prepared to present a range of costs which may vary between -30 % and +50 % from actual costs.

- Land Use – An evaluation of the proposed alternatives with regards to the current, intended, and reasonable anticipated future use of the site and its surroundings. Historical and current use of the property will be used as the best guide to future use, with planning and zoning, proximity of the site to natural resources, and all other applicable land-use criterion used to evaluate the proposed alternatives.

The ninth criterion, Community Acceptance will be evaluated after the public comment period for the FS.

5.2 Development of Alternatives

Following the technology evaluation performed in Section 4, technology process options that were retained have been combined into site-wide remedial alternatives that address the remedial goals for all of the media of concern: surface soil, subsurface soil, sediment, and groundwater. Because selection of a remedial action for upland areas is generally independent from those for the sediment area, alternatives for these two areas have been developed and will be evaluated separately. Once an alternative for each area has been identified, they can be combined into a single remedy for the site. Alternatives for the upland areas have been designated with a “U” prefix and those for the sediment area have been given a “S” designation.

Alternatives developed for the upland area include the following:

- Alternative U-1 – No Action
- Alternative U-2 – Institutional Controls, Excavation of Surface Soil, Removal of Subsurface Piping, Soil Cover, and MNA of Groundwater
- Alternative U-3 - Excavation of Surface Soil and Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater
- Alternative U-4 – Excavation of Surface Soil and Subsurface Soil Which Exceeds Unrestricted Use SCOs, Removal of Subsurface Piping

Alternatives developed for the sediment area include the following

- Alternative S-1 – No Action
- Alternative S-2 – Excavation/Dredging of Surface Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR

- Alternative S-3 – Excavation/Dredging of Surface Sediment and Subaqueous Capping
- Alternative S-4 – Full Excavation/Dredging of Impacted Sediment and Placement of Backfill

These alternatives are described and evaluated below.

5.3 Description and Detailed Analysis of Upland Alternatives

A specific description of each remedial alternative is provided with a detailed evaluation using criteria established in the DER-10.

5.3.1 Alternative U-1 – No Action

5.3.1.1 Description

The No Action alternative is retained as a baseline to compare subsequent alternatives. No action would be taken to address impacted surface soil, subsurface soil, NAPL, or groundwater.

5.3.1.2 Overall Protection of Human Health and the Environment

Table 5-1 summarizes Alternative U-1's ability to meet remedial objectives. As the table shows, none of the identified RAOs for the site will be achieved. None of the potential exposure pathways to surface soil, subsurface soil, and groundwater identified in the RI would be eliminated or controlled under this alternative.

This Alternative does not provide protection of human health and/or the environment.

5.3.1.3 Compliance with SCGs

No applicable location- or action-specific SCGs exist for this alternative. This alternative will not meet chemical-specific SCGs for groundwater or soil.

5.3.1.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is evaluated by considering COC remaining in impacted media once remedial construction is complete. The No Action alternative would not remove or treat any existing COC and would not provide any method to control those that remain.

5.3.1.5 Reduction of Toxicity, Mobility, or Volume

The No Action alternative would not reduce the toxicity, mobility, or volume of COC in surface soil, subsurface soil, NAPL, sediments, or groundwater on-site or off-site.

5.3.1.6 Short-Term Effectiveness

The potential exposures to COC in subsurface soil and groundwater identified in the upland portion of the site are generally associated with potential future conditions rather than those currently found at the site. Most of the area, and all of the area where the highest concentrations of COC are found, are on property owned by NYSEG. Under current use, exposures to site media are limited and infrequent. No significant exposures to surface soil were identified in the RI.

Implementation of this alternative does not pose any short-term risks because no remedial activities would be performed on the site.

5.3.1.7 Implementability

No Action can be implemented easily.

5.3.1.8 Cost Effectiveness

There are no costs are associated with this alternative, however, this alternative does not address any of the three effectiveness criteria.

5.3.1.9 Land Use

The site is comprised of two contiguous parcels both zoned for commercial use by the Town of Milo, New York. The site is located in an urban setting where the surrounding land is used for commercial and industrial purposes. Current abutting properties include commercial properties to the east, west, and north, with the Keuka Lake outlet abutting to the south. The site is included in the Yates County/Penn Yan waterfront revitalization master plan. One of the recommendations of the waterfront revitalization plan is that the adjoining properties to the north of the Keuka Lake outlet between Liberty Street and Main Street be re-developed as mixed-use commercial/residential properties.

The No Action alternative will not allow a designation that is consistent with the current zoning of the site and the current use of adjacent properties. The No Action alternative does not allow for redevelopment of the site under the waterfront revitalization plan.

5.3.2 Alternative U-2 – Institutional Controls, Excavation of Surface Soil, Removal of Subsurface Piping, Soil Cover, and MNA of Groundwater

5.3.2.1 Description

Figure 5-1 shows the layout of Alternative U-2. Design elements of the alternative include the following:

- Excavation of exposed surface soil to a depth of one foot
- Removal of piping near holder foundation containing NAPL
- Removal of piping south of concrete pad that may contain NAPL
- Off-site management of waste at a thermal treatment facility or landfill
- Soil cover to prevent exposure to soil exposed by excavation
- Institutional controls to restrict contact with subsurface soil and groundwater
- Institutional controls to prevent groundwater use
- Institutional controls to limit future site use to non-residential
- Institutional controls to require any future occupied structures to be constructed with vapor barriers.
- MNA of groundwater

As part of Alternative U-2, a subsurface pipe containing NAPL and any exposed surface soils within the identified limits of surface impacts in the upland area will be excavated. The existing floor slab of the demolished warehouse/garage will not be removed. The final limits of excavation would be

established based on the results of a pre-design investigation. Excavation would be conducted using conventional earth moving equipment.

Soil and debris would be direct loaded into lined and covered trucks for off-site transportation. Excavated materials would be transported to a permitted thermal treatment facility or landfill. Approximately 1,010 cubic yards of surface soil over 27,225 SF would be removed under this option. The limits of excavation associated with the subsurface piping will be determined during a pre-design investigation; the assumed excavation is over an area of 500 square feet to a depth of 5 feet bgs for an additional 100 CY. The total quantity of soil to be excavated and sent off-site for treatment or disposal is estimated to be 1,820 tons.

When excavation is complete, excavation areas would be backfilled to original grade using clean imported fill to provide a soil cover. Vegetated areas will receive a layer of topsoil, seed, and mulch.

After soil and piping are removed, the limited concentrations of COC in groundwater would be addressed by MNA to document the rate at which the COC concentrations are decreasing within the groundwater. MNA monitoring would be conducted as described below. As part of MNA implementation, it is assumed that one new monitoring well will be required.

Institutional controls, including an environmental easement and a SMP, would be established in order to address exposures to subsurface soil, groundwater, and soil vapor. A SMP would be developed to specify procedures to be followed in the event utility workers need to perform work in impacted areas. An environmental easement would be emplaced to restrict future development of impacted areas, ensure that potentially impacted groundwater is not utilized as a potable water source and require that any buildings constructed onsite include a vapor barrier to prevent vapor intrusion.

OM&M activities which would be required once site construction is completed would include the following:

- Annual inspections
- Twice yearly groundwater monitoring in all site monitoring wells remaining (10 wells) for a period of two years. After that time, the number of wells monitored would be reduced to three and the frequency of monitoring would be reduced to annually for a period of five years. At that time, the need for additional monitoring would be reevaluated. Groundwater samples would be analyzed for MNA parameters and COC. After the initial two year period, the required analyses would be reevaluated.
- Status reports once per year.

5.3.2.2 Overall Protection of Human Health and the Environment

Table 5-1 identifies which remedial technologies included in Alternative U-2 would meet the remedial action objectives for surface soils, subsurface soils, and groundwater. As the table shows, all identified RAOs related to protection of human health will be addressed by this alternative. Potential exposures to surface soil would be addressed by excavating surface soil requiring remediation. Exposures to COC in subsurface soil will be addressed by excavation of the pipe containing NAPL and institutional controls for impacted soils throughout the rest of the site. Exposures to groundwater will be prevented by establishing institutional controls. The RAO requiring mitigation of potential future impacts from soil vapor will be addressed by requiring vapor barriers installed in future buildings. RAOs associated with

controlling the source of COC to groundwater addressing NAPL and preventing migration are not fully met.

5.3.2.3 Compliance with SCGs

The primary action-specific and location-specific regulatory requirements potentially applicable to Alternative U-2 include the following:

- Requirements to avoid adverse impacts to floodplains – these will be addressed by returning the site to existing grade after excavation.
- Requirements for a protection of waters permit to address upland construction impacts to the outlet.
- National and state historic preservation regulations – these will be addressed by requiring the contractor to protect the on-site MGP building. Changes to the limit of excavation may be required to protect the building.
- Requirements to dispose of waste material in accordance with New York solid waste management rules and guidance on management of MGP wastes – these will be addressed by sending MGP impacted waste to appropriately permitted landfills and thermal treatment facilities.
- Local ordinances concerning noise, permitting, and transportation – these will be addressed by restricting contractor's work practices in accordance with local requirements and obtaining required local permits.
- Occupational safety and health regulations for construction and hazardous waste site operations – these will be addressed by requiring the contractor to complete all work under the provisions of a site-specific health and safety plan (HASP).
- Requirements for SPDES permitted discharge of water generated by dewatering – these will be addressed by meeting the substantive requirements of an SPDES discharge permit including treating water to meet discharge limits. An O&M Plan will be prepared to ensure compliance.
- Regulations concerning work near overhead power lines – these will be addressed by relocating or de-energizing power lines and equipment, providing shields, or ensuring work takes place outside of required clearances.
- Requirements for management of air emissions under the Clean Air Act and the New York State Department of Health (NYSDOH) – these will be addressed by implementation of a site HASP and a Community Air Monitoring Plan (CAMP) during remedial activities.

The design of this alternative will be prepared to address these requirements and to allow required permits to be obtained.

Chemical-specific SCGs shown in Table 3-1, which were used to develop remedial criteria for soil and groundwater, will be addressed by this alternative.

5.3.2.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is evaluated by considering COC remaining in impacted media once remedial construction is complete. Alternative U-2 calls for removal and off-site

management of impacted surface soils and NAPL containing structures. Those that remain in subsurface soil will be addressed by institutional controls. An environmental easement will ensure that these measures continue to be effective. The COC which remains in groundwater poses minimal risk to human health and should be reduced by MNA over time. Significant quantities of NAPL and material which may act as a source of COC to groundwater will remain.

5.3.2.5 Reduction of Toxicity, Mobility, or Volume

The proposed scope of Alternative U-2 calls for removal of surface soils and piping containing NAPL and placement of a soil cover to prevent exposure of COCs. Given the concentrations of COC in surface soil and the pipe, the excavated material would be characterized before disposal to see if it could be managed at a solid waste landfill permitted to receive contaminated soil or at an off-site thermal treatment facility. For that reason, this alternative partially achieves the program goal of reduction of toxicity, mobility, or volume through treatment.

MNA would, in time, reduce the toxicity and mobility of COC in groundwater in the remaining areas of the site.

5.3.2.6 Short-Term Effectiveness

The potential exposures to COC in soil and groundwater identified in the upland portion of the site are generally associated with potential future conditions rather than those currently found at the site. All of the upland areas where COCs are found are on property owned by NYSEG. Under current use, exposures to site media are limited and infrequent. No significant exposures to surface soil were identified in the RI. Any future uses of the site will most likely be for commercial use.

There are significant potential short-term risks associated with implementation of Alternative U-2, including the following:

- Risks to construction workers associated with exposure to COC and general construction and transport
- Risks to nearby residents and the community associated with dust, noise, and air emissions and truck traffic
- Risks to the environment associated with the potential release of COC during construction.

Those risks can be minimized using personal protective equipment and engineering controls. Alternative U-2 is expected to take one to one and a half months to implement, so short term risks will be less than other active alternatives.

5.3.2.7 Implementability

Excavation and offsite thermal treatment or landfill disposal of soils can typically be easily implemented. Odor management during the excavation would be a critical element for successful implementation of the excavation, due to the proximity to nearby residents and businesses. Odors can be managed through the use of odor control sprays and foams or by modifying work procedures.

MNA can be easily implemented utilizing existing monitoring wells, supplemented by the additional well. Institutional controls are also easily implemented, but would require coordination with NYSEG and the DEC to file an environmental easement on the site.

5.3.2.8 Cost Effectiveness

The total estimated cost for Alternative U-2 is $690,000. This cost includes $520,000 in capital costs and $17,000 present value of operation, maintenance and monitoring costs for the next 30 years. The capital cost includes a 20% contingency, engineering expenses and administrative fees. Tables 5-2 and 5-3 detail capital and OM&M costs respectively. Details of these cost estimates are provided in Appendix C.

This alternative ranks low in long-term effectiveness because it does not address most RAOs and leaves significant quantities of COCs in place. It also ranks low in reductions of toxicity, volume, and mobility, but ranks high in short-term effectiveness. Because its cost is relatively low it is evaluated as low to moderate in cost effectiveness.

5.3.2.9 Land Use

See section 5.3.1.9 for the current and future land use of the upland portions of the site.

The proposed scope of Alternative U-2 will allow commercial use of the site with institutional controls. This designation is consistent with the current zoning of the site and the current use of adjacent properties.

5.3.3 Alternative U-3 – Excavation of Surface Soil and Visually Impacted Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater

5.3.3.1 Description

Figure 5-2 shows the layout of Alternative U-3. Design elements of the alternative include the following:

- Excavation of exposed surface soil exceeding commercial SCOs
- Excavation of visually impacted sub-surface soils and subsurface soils which exceed 500 mg/kg of total SVOCs and 10 mg/kg of total VOCs
- Removal of the former gas holder foundation and adjacent structures
- Removal of subsurface piping
- Off-site management of waste at a thermal treatment facility or landfill
- Institutional controls to prevent groundwater use
- Institutional controls to limit future site use to non-residential
- MNA of groundwater

As part of Alternative U-3 exposed surface soils within the identified limits of surface impacts in the upland area exceeding commercial SCOs and sub-surface soils exceeding remedial criteria will be excavated. In addition to the removal of soils, the former gas holder foundation and adjacent structures will be removed. The existing concrete pad on grade will be retained except in a small area near the holder and pipe, unless otherwise determined during the design phase. The final limits of excavation would be established based on the results of a pre-design investigation. Excavation would be conducted using conventional earth moving equipment. A temporary watertight sheet pile wall would be required to permit removal of the former gas holder foundation and subsurface soil near the

Keuka Lake outlet. A sheet pile wall may also be required to permit removal of soils next to the former MGP building. During the pre-design investigation, the presence of subsurface structures and all obstructions would be evaluated to allow verification of the limits of excavation.

Dewatering and construction water treatment systems would be required to maintain dry conditions during excavation and backfill. The dewatering system would consist of pumps installed in sumps within the excavation. Water removed by the system would be piped to the construction water treatment system for removal of organic constituents and cyanide and then discharged to surface water. It is estimated that removal and treatment of equal to or less than 50 gallons per minute will be required.

As seen in Figure 5-2, surface soils over 27,465 SF will be excavated to a depth of one foot. North of the MGP building visually impacted subsurface soils over approximately 2,375 SF will be excavated to an average depth of 5 feet, along with 820 CY overlaying the former gas holder foundation as well as the holder foundation itself. South of the MGP building 5,150 SF of subsurface soils will be excavated to an average depth of 7 feet. A total of 3,340 CY of soil and debris would be direct loaded into lined and covered trucks for off-site transportation. Excavated materials would be transported to a permitted thermal treatment facility or landfill. The total quantity of soil to be excavated and sent off-site for treatment or disposal is estimated to be 5,510 tons.

When excavation is complete, excavation areas would be backfilled to original grade using clean imported fill. Vegetated areas will receive a layer of topsoil, seed, and mulch.

After soil and NAPL are removed, the limited concentrations of COC in groundwater would begin to decrease with time. MNA would be implemented to document the rate at which the COC concentrations are decreasing within the groundwater. MNA monitoring would be conducted as described below. As part of MNA implementation, it is assumed two monitoring wells will need to be replaced and two new monitoring wells will be required.

Institutional controls would be established in areas which are not excavated until the groundwater meets cleanup levels established in Section 3. An environmental easement would be emplaced to restrict future development of impacted areas and ensure that potentially impacted groundwater is not utilized as a potable water source.

OM&M activities which would be required once site construction is completed would include the following:

- Annual inspections
- Twice yearly groundwater monitoring in five selected site monitoring wells for a period of two years. After that time, the number of wells monitored would be reduced to three and the frequency of monitoring would be reduced to annually for a period of five years. At that time, the need for additional monitoring would be reevaluated. Groundwater samples would be analyzed for MNA parameters and COC. After the initial two year period, the required analyses would be reevaluated.
- Status reports once per year.

5.3.3.2 Overall Protection of Human Health and the Environment

Table 5-1 identifies which remedial technologies included in Alternative U-3 would meet the remedial action objectives for surface soils, subsurface soils, groundwater, NAPL and soil vapor. As the table shows, all identified RAOs will be addressed by this alternative. Potential exposures to surface soil would be addressed by excavating surface soil requiring remediation. Exposures to COC in subsurface soil will be addressed by excavation of soils exceeding remedial criteria. Exposures to groundwater and migration of COC in groundwater will be prevented by establishing institutional controls and monitoring through MNA in excavated and down-gradient areas. The RAO for mitigating potential future impacts from soil vapor will be addressed by excavating soil with visual evidence of MGP impact. RAOs related to controlling NAPL and the source of COC to groundwater, and soil vapor will be addressed by removing all NAPL and visibly stained soil.

5.3.3.3 Compliance with SCGs

The primary action- and location-specific regulatory requirements potentially applicable to Alternative U-3 include the following:

- Requirements to avoid adverse impacts to floodplains – these will be addressed by returning the site to existing grade after excavation.
- Requirements of a protection waters permit to address upland construction impacts on the outlet.
- National and state historic preservation regulations – these will be addressed by requiring the contractor to protect the on-site MGP building. Changes to the limit of excavation may be required to protect the building.
- Requirements to dispose of waste material in accordance with NY solid waste management rules and guidance on management of MGP wastes – these will be addressed by sending MGP impacted waste to appropriately permitted landfills and thermal treatment facilities.
- Local ordinances concerning noise, permitting, and transportation – these will be addressed by restricting contractor's work practices in according with local requirements and obtaining required local permits.
- Occupational safety and health regulations for construction and hazardous waste site operations – these will be addressed by requiring the contractor to complete all work under the provisions of a site-specific HASP.
- Requirements for SPDES permitted discharge of water generated by dewatering – these will be addressed by meeting the substantive requirements of an SPDES discharge permit including treating water to meet discharge limits. An O&M Plan will be prepared to ensure compliance.
- Regulations concerning work near overhead power lines – these will be addressed by relocating or de-energizing power lines and equipment, providing shields, or ensuring work takes place outside of required clearances.
- Requirements for management of air emissions under the Clean Air Act and the NYS Department of Health – these will be addressed by implementation of a site HASP and a CAMP during remedial activities.

The design of this alternative will be prepared to address these requirements and to allow required permits to be obtained.

Chemical-specific SCGs shown in Table 3-1, which were used to develop remedial criteria for soil and groundwater, will be addressed.

5.3.3.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is evaluated by considering COC remaining in impacted media once remedial construction is complete. As indicated previously, Alternative U-3 calls for removal and off-site management of the great majority of these materials. Those that remain do not pose a significant exposure risk. The small amount of COC which would remain in groundwater would pose minimal risk and should be effectively reduced by MNA within a short period of time. NAPL and material that may act as a source of COC to groundwater will be removed.

5.3.3.5 Reduction of Toxicity, Mobility, or Volume

The proposed scope of Alternative U-3 calls for removal of soil with the highest concentrations of COC. This will lead to removal of a substantial portion of the total mass of COC present at the site. Given the concentrations of COC in subsurface soil, most of the material excavated would be managed at an off-site thermal treatment facility. For that reason, this alternative achieves the program goal of reduction of toxicity, mobility, or volume through treatment.

MNA would, in time, reduce the toxicity and mobility of COC in the groundwater.

5.3.3.6 Short-term effectiveness

The potential exposures to COC in soil, groundwater, and sediment identified in the upland portion of the site are generally associated with potential future conditions rather than those currently found at the site. All of the upland areas where COCs are found are on property owned by NYSEG. Under current use, exposures to site media are limited and infrequent. Any future uses of the site will most likely be for commercial use.

There are significant potential short-term risks associated with implementation of Alternative U-3, including the following:

- Risks to construction workers associated with exposure to COC and general construction and transport
- Risks to nearby residents and the community associated with dust, noise, and air emissions and truck traffic
- Risks to the environment associated with the potential release of COC during construction.

Those risks can be minimized using personal protective equipment and engineering controls. Alternative U-3 is expected to take one and a half to two months to implement, so short term risks will be higher than alternative U-2.

5.3.3.7 Implementability

Excavation and offsite thermal treatment or landfill disposal of soils can typically be easily implemented. Odor management during the excavation would be a critical element for successful

implementation of the excavation alternative, due to the proximity to nearby residents. Odors can be managed through the use of odor control sprays and foams and by modifying work procedures.

Portions of excavations would need to be shored to protect adjacent structures, roadways, and/or utilities and to provide protection from the adjacent Keuka Lake outlet. Figure 5-2 shows the proximity of the limits of excavation to the locations where historic subsurface structures are located. It is likely that there are other underground structures that will be identified during construction that are presently not shown. In order to address these obstructions, pre-excavation is likely to be required in order to allow installation of the wall. A pre-design investigation will be required prior to excavation, which will likely include installation of borings along the alignment of the wall. To protect the MGP building during excavation, the specific type of shoring used near the building may be modified during the design phase. Because of these complexities, it may be necessary to reevaluate the achievable limits of excavation during the design and construction processes.

Excavation below the water table would require a temporary water treatment plant and discharge technology to be implemented during construction. Temporary dewatering and water treatment systems are routinely implemented, and can be implemented with relative ease at this site.

MNA can be easily implemented utilizing existing monitoring wells, supplemented by the additional wells. Institutional controls are also easily implemented.

5.3.3.8 **Cost** Effectiveness

The total estimated cost for Alternative U-3 is $2,300,000. This cost includes $2,140,000 in capital costs and $160,000 present value of operation, maintenance and monitoring costs for the next 30 years. The capital cost includes a 20% contingency, engineering expenses and administrative fees. Tables 5-4 and 5-5 detail capital and OM&M costs respectively. Details of these cost estimates are provided in Appendix C.

This alternative ranks high in both long-term effectiveness and reduction of toxicity, volume of mobility in COC because it addresses all RAOs, removes the majority of COCs and treats COC in soil. It ranks moderate in terms of short-term effectiveness because there are significant impacts during construction which can be effectively controlled.

Overall, this alternative is evaluated as cost-effective because although its costs are moderate to high, the benefits in terms of meeting objectives are high.

5.3.3.9 Land Use

See section 5.3.1.9 for the current and future land use of the upland portions of the site.

The proposed scope of Alternative U-3 will allow commercial use of the site. This designation is consistent with the current zoning of the site and the current use of adjacent properties, as well as the recommended future use of the site under the waterfront revitalization plan.

5.3.4 Alternative U-4 – Excavation of Surface Soil and Subsurface Soil Which Exceeds Unrestricted Use SCOs, and Removal of Subsurface Structures

5.3.4.1 Description

Figure 5-3 shows the layout of Alternative U-4. Design elements of the alternative include the following:

- Removal of existing concrete pad
- Excavation of surface and sub-surface soils exceeding un-restricted SCO's
- Removal of piping containing NAPL
- Removal of the former gas holder foundation and adjacent structures
- Off-site management of waste at a thermal treatment facility or landfill

As part of Alternative U-4 exposed surface soils within the identified limits of surface impacts in the upland area and sub-surface soils exceeding NY un-restricted SCO's will be excavated. The final required limits of excavation would be established based on the results of a pre-design investigation. Excavation would be conducted using conventional earth moving equipment. A temporary watertight sheet pile wall would be required to permit removal of the former gas holder foundation and subsurface soil near the Keuka Lake outlet. A sheet pile wall may also be required to permit removal of soils next to the former MGP building. During the pre-design investigation, the presence of subsurface structures and all obstructions would be evaluated to allow verification of the limits of excavation.

Dewatering and construction water treatment systems would be required to maintain dry conditions during excavation and backfill. The dewatering system would consist of pumps installed in sumps in the excavation. Water removed by the system would be piped to the construction water treatment system for removal of organic constituents and cyanide and then discharged to surface water. It is estimated that removal and treatment of equal to or less than 50 gallons per minute will be required.

As seen in Figure 5-3, surface soils over 34,880 SF will be excavated to a depth of one foot. North and west of the MGP building subsurface soils exceeding un-restricted SCOs over approximately 10,790 SF will be excavated to an average depth of 5 feet, along with 820 CY overlaying the former gas holder foundation as well as the holder foundation itself. South of the MGP building 5,540 SF of subsurface soils will be excavated to an average depth of 7 feet. A total of 4,940 CY of soil and debris would be direct loaded into lined and covered trucks for off-site transportation. Excavated materials would be transported to a permitted thermal treatment facility. The total quantity of soil to be excavated and sent off-site for treatment or disposal is estimated to be 8,150 tons.

When excavation is complete, excavation areas would be backfilled to original grade using clean imported fill. Vegetated areas will receive a layer of topsoil, seed, and mulch.

This alternative removes all sources of COC in the upland areas. The groundwater contamination is restricted to a single well inside the excavation area. Excavation of all contaminated materials should result in immediate restoration of groundwater in that area. Installation of two monitoring wells is included in this alternative to monitor the groundwater in the currently affected area. A single round of groundwater monitoring for the six remaining wells and two new monitoring wells is included in this

alternative to confirm the effectiveness of the remedial action. If post excavation groundwater analysis indicates continued exceedances, a MNA plan will be developed.

5.3.4.2 Overall Protection of Human Health and the Environment

Table 5-1 identifies which remedial technologies included in Alternative U-4 would meet the remedial action objectives for surface soils, subsurface soils, groundwater, NAPL and soil vapor. As the table shows, all identified RAOs will be addressed by this alternative. Potential exposures to surface soil would be addressed by excavating surface soil requiring remediation. Exposures to COC in subsurface soil will be addressed by excavation of soils exceeding un-restricted SCOs. Exposures to groundwater will be prevented by excavation of all source COCs. The RAO for mitigating potential future impacts from soil vapor will be addressed by excavating soil with visual evidence of MGP impact. RAOs associated with removing the source of COC to groundwater and soil vapor and removing NAPL are also addressed. The limited groundwater containing COC will be removed and treated as part of the excavation dewatering process.

5.3.4.3 Compliance with SCGs

The primary action- and location-specific regulatory requirements potentially applicable to Alternative U-4 include the following:

- Requirements to avoid adverse impacts to floodplains – these will be addressed by returning the site to existing grade after excavation.
- Requirements for a protection of waters permit to address upland construction impacts on the outlet.
- National and state historic preservation regulations – these will be addressed by requiring the contractor to protect the on-site MGP building. Changes to the limit of excavation may be required to protect the building.
- Requirements to dispose of waste material in accordance with NY solid waste management rules and guidance on management of MGP wastes – these will be addressed by sending MGP impacted waste to appropriately permitted landfills and thermal treatment facilities.
- Local ordinances concerning noise, permitting, and transportation – these will be addressed by restricting contractor's work practices in according with local requirements and obtaining required local permits.
- Occupational safety and health regulations for construction and hazardous waste site operations – these will be addressed by requiring the contractor to complete all work under the provisions of a site-specific HASP.
- Requirements for SPDES permitted discharge of water generated by dewatering – these will be addressed by meeting the substantive requirements of an SPDES discharge permit including treating water to meet discharge limits. An O&M Plan will be prepared to ensure compliance.
- Regulations concerning work near overhead power lines – these will be addressed by relocating or de-energizing power lines and equipment, providing shields, or ensuring work takes place outside of required clearances.

- Requirements for management of air emissions under the Clean Air Act and the NYS Department of Health – these will be addressed by implementation of a site HASP and a CAMP during remedial activities.

The design of this alternative will be prepared to address these requirements and to allow required permits to be obtained.

Chemical-specific SCGs shown in Table 3-1, which were used to develop remedial criteria for soil and groundwater, will be addressed.

5.3.4.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is evaluated by considering COC remaining in impacted media once remedial construction is complete. As indicated previously, Alternative U-4 calls for removal and off-site management of all impacts exceeding unrestricted criteria. Those that remain do not pose a significant exposure risk.

5.3.4.5 Reduction of Toxicity, Mobility, or Volume

The proposed scope of Alternative U-4 calls for removal of soil with concentrations of COC exceeding un-restricted criteria. Given the concentrations of COC in subsurface soil, most of the material excavated would be managed at an off-site thermal treatment facility.

Excavation of source COCs will achieve reduction of toxicity and volume in groundwater.

5.3.4.6 Short-Term Effectiveness

The potential exposures to COC in soil and groundwater identified in the upland portion of the site are generally associated with potential future conditions rather than those currently found at the site. All of the upland areas where COCs are found are on property owned by NYSEG. Under current use, exposures to site media are limited and infrequent. Any future uses of the site will most likely be for commercial use.

There are significant potential short-term risks associated with implementation of Alternative U-4, including the following:

- Risks to construction workers associated with exposure to COC and general construction and transport
- Risks to nearby residents and the community associated with dust, noise, and air emissions and truck traffic
- Risks to the environment associated with the potential release of COC during construction.

Those risks can be minimized using personal protective equipment and engineering controls. Alternative U-4 is expected to take one and a half to two months to implement, so short term risks will be higher than alternatives U-2 or U-3.

5.3.4.7 Implementability

Excavation and offsite thermal treatment or landfill disposal of soils can typically be easily implemented. Odor management during the excavation would be a critical element for successful

implementation of the excavation alternative, due to the proximity to nearby residents. Odors can be managed through the use of odor control sprays and foams and by modifying work procedures.

Portions of excavations would need to be shored to protect adjacent structures, roadways, and/or utilities and to provide protection from the adjacent Keuka Lake outlet. Figure 5-3 shows the proximity of the limits of excavation to the locations where historic subsurface structures are located. It is likely that there are other underground structures that will be identified during construction that are presently not shown. In order to address these obstructions, pre-excavation is likely to be required in order to allow installation of the wall. A pre-design investigation will be required prior to excavation, which will likely include installation of borings along the alignment of the wall. To protect the MGP building during excavation, the specific type of shoring used near the building may be modified during the design phase. Because of these complexities, it may be necessary to reevaluate the achievable limits of excavation during the design and construction processes.

Excavation below the water table would require a temporary water treatment plant and discharge technology to be implemented during construction. Temporary dewatering and water treatment systems are routinely implemented and can be implemented with relative ease at this site.

5.3.4.8 Cost Effectiveness

The total estimated cost for Alternative U-4 is $2,910,000. This cost includes $2,880,000 in capital costs and $30,000 present value of operation, maintenance and monitoring costs for the next 30 years. The capital cost includes a 20% contingency, engineering expenses and administrative fees. Tables 5-6 and 5-7 detail capital and OM&M costs, respectively. Details of the cost estimates are provided in Appendix C.

This alternative ranks high in both long-term effectiveness and reduction of toxicity, volume of mobility in COC because it addresses all RAOs, removes the majority of COCs and treats COC in soil. It ranks moderate in terms of short-term effectiveness because there are significant impacts during construction which can be effectively controlled.

Overall, this alternative is evaluated as cost –effective because although its costs are moderate to high, the benefits in terms of meeting objectives are high.

5.3.4.9 Land Use

See section 5.3.1.9 for the current and future land use of the upland portions of the site.

The proposed scope of Alternative U-4 will allow all uses of the site, both current and future. This designation is consistent with the current zoning of the site and the current use of adjacent properties, as well as the recommended future use of the site under the waterfront revitalization plan.

5.4 Description and Detailed Analysis of Sediment Alternatives

A specific description of each remedial alternative is provided with a detailed evaluation using criteria the established in the DER-10.

5.4.1 Alternative S-1 – No Action

5.4.1.1 Description

The No Action alternative is retained as a baseline to compare subsequent alternatives. No action would be taken to address sediments.

5.4.1.2 Overall Protection of Human Health and the Environment

Table 5-1 summarizes Alternative S-1's ability to meet remedial objectives. As the table shows, none of the identified RAOs for the site will be achieved. None of the potential exposure pathways to sediments identified in the RI would be eliminated or controlled under this alternative.

This Alternative does not provide protection of human health and/or the environment.

5.4.1.3 Compliance with SCGs

No applicable location- or action-specific SCGs exist for this alternative. This alternative will not meet chemical-specific SCGs for groundwater or soil.

5.4.1.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is evaluated by considering COC remaining in impacted media once remedial construction is complete. Since Alternative S-1 does not include removal or treatment, all COC currently in sediment will remain.

5.4.1.5 Reduction of Toxicity, Mobility, or Volume

The No Action alternative would not reduce the toxicity, mobility, or volume of COC in affected sediment media. The program goal for reduction through treatment is not met.

5.4.1.6 Short-Term Effectiveness

This alternative does not pose any short-term risks because no remedial activities are performed on the site.

5.4.1.7 Implementability

The No Action alternative can be implemented easily.

5.4.1.8 Cost Effectiveness

Although there are no costs are associated with this alternative, because it does not meet any RAOs it is not considered cost effective.

5.4.1.9 Land Use

The Keuka Lake outlet is currently used for recreational boating and fishing. The area adjacent to the site is not a designated swimming area so direct contact exposures to impacted sediments is expected to be low. Access to the outlet for boating and fishing is primarily through the use of docks, so exposure to impacted sediment during recreation is expected to be minimal.

The No Action alternative is not consistent with the current use of the outlet or the recommended future use of the site under the waterfront revitalization plan.

5.4.2 Alternative S-2 – Excavation/Dredging of Visually Impacted Sediment

5.4.2.1 Description

Figure 5-4 shows the layout of Alternative S-2. Design elements of the alternative include the following:

- Excavation/dredging of sediment
- Backfill of dredged areas to restore original bathymetry
- Off-site transportation of excavated material to a permitted thermal treatment
- MNR

As part of Alternative S-2, sediment located within the identified limits of sediment impacts upstream of the outlet control structure will be excavated to remove sediment visually impacted by MGP materials. No impacts have been identified in the clay layer underlying the site, so it appears to serve as a confining layer and will serve as a natural limit of vertical excavation. In areas where there are no visual impacts, sediment will be removed to a depth of no more than two feet below the sediment surface. The final required limits of excavation would be refined based on the results of a pre-design investigation (PDI). If the results of the PDI indicate that concentrations of total PAHs in sediment are less than the established sediment background value of 42.6 mg/kg, the required depth of sediment removal may be reduced. Excavation would be conducted using conventional earth moving equipment. Alternate methods of sediment removal, including mechanical or hydraulic dredging, may be considered during design.

To permit excavation of the impacted materials the flow through the outlet will need to be diverted away from the excavation area. One possible method is to install a temporary watertight sheet-pile cofferdam for approximately 690 feet down the middle of the Keuka Lake outlet channel. Each side of the cofferdam would be closed off with sheet pile as needed to permit excavation while allowing normal flow through the outlet on the other side. After each side is closed off, the standing water will be pumped out of the cofferdam back into the outlet. To permit installation of sheet piling and excavation on the southern half of the outlet, an access road through the village owned park on the southern bank would be required. Special consideration will need to be taken around the abandoned railroad bridge. The bridge may need to be partially or fully demolished to permit cofferdam installation, or materials underneath the railroad bridge may need to be left in place to protect the bridge. Other options for diversion are equally feasible. The actual diversion method will be chosen during the design phase. The method described here will be assumed for the purposes of this FS.

Dewatering and construction water treatment systems would be required to maintain dry conditions during sediment removal and backfill. The dewatering system would consist of pumps installed in sumps in the excavation. Water removed by the system would be piped to the construction water treatment system for removal of organic constituents and then discharged to surface water. Removal and treatment rates would be determined during the pre-design investigation. Cofferdam sheet piles would be sealed with hydrophilic interlock sealant to minimize seepage into the excavation. It is estimated that a 50 gpm treatment system would provide sufficient treatment capacity to maintain a dewatered excavation.

Sediment would be transported to an onsite soil staging area staging for dewatering and/or blending of amendments to reduce soil moisture before leaving the site. Excavated materials would be transported to a permitted thermal treatment facility or landfill. Approximately 5,080 cubic yards of sediment from the top 2 feet over an area of 68,500 square feet would be excavated. An additional 13,170 square feet of sediment would be excavated as deep as the underlying clay layer for an additional 1,550 cubic yards of sediment. The total quantity of sediment to be excavated and sent off-site for treatment or disposal is estimated to be 11,670 tons.

When sediment removal is complete, excavation areas would be backfilled to original grade with clean imported fill. Fill material will be chosen to provide appropriate habitat for benthic organisms. The cofferdams and access road along the south will be removed, and the park and trail will be restored to their original condition with landscaping and planting.

The proposed scope of activities for alternative S-2 would result in removal of all NAPL impacted sediment and the sediment with the most significant PAH impacts. Exposure levels of the remaining COCs will be reduced by a decrease in concentration in the near-surface sediment zone through placement of clean backfill. Monitored Natural Recovery would be implemented to document COC concentrations in the near-surface sediment zone post construction.

OM&M activities which would be required once site construction is completed would include the following:

- Annual sediment sampling for two years and at year five. Samples would be analyzed for COC to demonstrate long-term trends of surface sediment contaminant concentrations. After the initial two year period, the required analyses would be re-evaluated.
- Status report once per year until cleanup objectives have been reached.

5.4.2.2 Overall Protection of Human Health and the Environment

Table 5-1 identifies which remedial technologies included in Alternative S-2 would meet the remedial action objectives for sediment. As the table shows, all RAOs associated with protectiveness of human health and the environment will be addressed by this alternative. Ingestion/direct contact with contaminated sediment would be addressed by excavation and backfill. Long term impacts to benthic organisms would be prevented by excavating the sediment with the highest concentrations of COCs likely to cause toxicity.

5.4.2.3 Compliance with SCGs

The primary action- and location-specific regulatory requirements potentially applicable to Alternative S-2 include the following:

- Requirements to avoid adverse impacts to floodplains – these will be addressed by returning the site to existing grade after excavation.
- Army Corps of Engineers and state regulations regarding dredging and filling regulations – A Joint Application for Permit must be prepared to secure Nationwide Permit 38 from the USACE to allow Cleanup of Hazardous and Toxic Waste from Waters of the United States as well as a protection of water/401 Water Quality Permit issued by the New York State Department of Environmental Conservation. The design and the workplan will conform to the provisions of these permits.

- Requirements to dispose of waste material in accordance with New York State solid waste management rules and guidance on management of MGP wastes – these will be addressed by sending MGP impacted waste to appropriately permitted landfills and thermal treatment facilities.
- Local ordinances concerning noise, permitting, and transportation – these will be addressed by restricting contractor's work practices in according with local requirements and obtaining required local permits.
- Occupational safety and health regulations for construction and hazardous waste site operations – these will be addressed by requiring the contractor to complete all work under the provisions of a site-specific HASP.
- Requirements for SPDES permitted discharge of water generated by dewatering – these will be addressed by meeting the substantive requirements of an SPDES discharge permit including treating water to meet discharge limits. Requirements for discharge to Publicly Owned Treatment Works (POTW) will be required to discharge treated waters into the Village of Penn Yan sanitary sewer system. An O&M Plan will be prepared to ensure compliance.
- Regulations concerning work near overhead power lines – these will be addressed by relocating or de-energizing power lines and equipment, providing shields, or ensuring work takes place outside of required clearances.
- Requirements for management of air emissions under the Clean Air Act and the NYS Department of Health – these will be addressed by implementation of a site HASP and a CAMP during remedial activities.

The design of this alternative will be prepared to address these requirements and to allow required permits to be obtained.

No Chemical-specific SCGs for sediment were identified; however the TBCs shown in Table 3-1 may be applicable in determining site-specific sediment objectives.

5.4.2.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is evaluated by considering COC remaining in impacted media once remedial construction is complete. During implementation of Alternative S-2 the most heavily impacted material will be removed and transported to an off-site facility. The COC which remain in sediment outside of the excavation area would pose minimal risk and should be effectively reduced by MNR over time.

5.4.2.5 Reduction of Toxicity, Mobility, or Volume

The proposed scope of Alternative S-2 calls for removal of visually impacted sediment and otherwise impacted sediment in the top one foot between the site and the railroad bridge. This will lead to removal of the majority of the total mass of COC present at the site. Given the concentrations of COC in sediment, most of the material excavated would be managed at an off-site thermal treatment facility. This alternative achieves the program goal of reduction of volume through excavation and reduction of volume, mobility, and toxicity through MNR.

5.4.2.6 Short-Term Effectiveness

There are significant potential short-term risks associated with implementation of Alternative S-2, including the following:

- Risks to construction workers associated with exposure to COC and general construction and transport
- Risks to nearby residents and the community associated with dust, noise, and air emissions and truck traffic
- Damage to and loss of use of the parkland across the outlet from the site during construction activities.
- Damage to the benthic and fish communities due to loss of habitat during construction
- Risks to the environment associated with the potential release of COC during construction and disruption of benthic habitat during excavation.

Those risks can be minimized using personal protective equipment and engineering controls.

5.4.2.7 Implementability

Implementation of sediment excavation/dredging presents several challenges that will need to be overcome. During installation of cofferdams turbidity control measures will be needed in open water to prevent significant impacts downstream. A pre-design investigation will be required to determine the geotechnical design parameters of the soils underlying the sediment to determine the final cofferdam layout and configuration. Access agreements for adjacent properties to install the cofferdams will be key to implementation of this alternative. To permit excavation south of the sheet pile wall an access road through the village owned park on the southern bank would be required. Excavation work in the lake outlet should occur during the low flow months of the year (July – October), if practical. Special design consideration will need to be taken regarding possible scour of the bank or sediment in the flow channel as velocities will approximately double during the excavation.

Excavation and offsite thermal treatment or landfill disposal of contaminated sediments can be implemented with relative ease, using conventional excavation equipment. Excavation of the area south of the outlet centerline will require access to Village of Penn Yan owned park to the south of the Keuka Lake outlet, and restoration of the park after completion of excavation activities. A stockpile area on the upland area of the site would be required for dewatering and/or blending of amendments to reduce soil moisture before leaving the site. The specific methods used for sediment pre-treatment will depend on treatment/disposal facility acceptance requirements regarding moisture content and acceptable amendments. Treatment/disposal facilities and acceptance criteria will be identified during the remedial design phase.

There are six storm drain outfalls that discharge into the Keuka Lake outlet along the proposed area of sediment remediation. These outlets would need to be plugged and the discharge re-routed outside the cofferdam during excavation, which will require agreements with the sewer owners.

Sediment excavation will require significant dewatering to manage the seepage of water around the cofferdams and flow from the ground water table. Once cofferdams are completed, it is anticipated that the standing water within the cofferdams can be pumped into the Keuka Lake outlet without treatment. If the water exhibits any sheens or evidence of impact, it will require treatment prior to

discharging to the outlet. A temporary water treatment plant and discharge technology will be implemented during construction. Temporary pump and treat systems are routinely implemented, and can be implemented with relative ease at this site. A 50 gpm treatment system is estimated to be sufficient for maintaining a dewatered excavation.

Odor management during the excavation may be necessary for successful implementation of the excavation alternative, due to the proximity to nearby residents. Odors can be managed through the use of odor control sprays and foams and by modifying work procedures.

Sediment excavation will require a number of local, state, and federal permits, which will require a significant lead time to obtain. Permitting for the excavation is expected to take approximately 6-12 months. Permitting activities would run concurrent with remediation design activities.

5.4.2.8 Cost Effectiveness

The total estimated cost for Alternative S-2 is $4,781,200. This cost includes $4,631,200 in capital costs and $150,000 present value of operation, maintenance and monitoring costs for the next 30 years. The capital cost includes a 20% contingency, engineering expenses and administrative fees. Tables 5-8 and 5-9 detail capital and OM&M costs, respectively. Details of these cost estimates are provided in Appendix C.

This alternative ranks high in both long-term effectiveness and reduction of toxicity, volume of mobility in COC because it addresses all RAOs, removes the majority of COCs and treats COC in sediment. It ranks moderate in terms of short-term effectiveness because there are significant impacts during construction which can be effectively controlled.

Overall this alternative is evaluated as cost effective. Although its costs are high, the benefits in terms of meeting objectives are also high.

5.4.2.9 Land Use

See section 5.4.1.9 for the current and future land use of the Keuka Lake Outlet.

The proposed scope of work for alternative S-2 will remove the sediments with the highest concentrations of COCs and backfill with clean sediment. The existing biota should easily re-populate the remediated area. This alternative is consistent with the current use of the outlet, as well as the recommended future use of the site under the waterfront revitalization plan.

5.4.3 Alternative S-3 – Excavation/Dredging of Shallow Sediment and Subaqueous Capping

5.4.3.1 Description

Figure 5-5 shows the layout of Alternative S-3. Design elements of the alternative include the following:

- Excavation of surface sediment within the limits of sediment impacts associated with the site
- Capping of impacted sediment
- Reactive capping of visibly impacted sediment

- Off-site transportation of excavated material to a permitted thermal treatment

As part of Alternative S-3, sediment located within the identified limits of sediment impacts upstream of the railroad bridge will be excavated to a minimum depth of one foot below the existing sediment surface. Final excavation depth will be based on the final cap design to maintain the current bathymetry. A temporary watertight sheet-pile cofferdam would be required to permit excavation and accurate cap placement. Cofferdam options are discussed in Section 5.4.2.1. As with Alternative S-2, alternate methods of sediment removal, including mechanical or hydraulic dredging, may be considered during design.

Dewatering and construction water treatment systems would be required to maintain dry conditions during sediment removal and backfill. The dewatering system would consist of pumps installed in sumps in the excavation. Water removed by the system would be piped to the construction water treatment system for removal of organic constituents and then discharged to surface water. Removal and treatment rates would be determined during the pre-design investigation. Cofferdam sheet piles would be sealed with hydrophilic interlock sealant to minimize seepage into the excavation. It is estimated that a 50 gpm treatment system would provide sufficient treatment capacity to maintain a dewatered excavation.

Sediment would be transported to an onsite soil staging area for dewatering and/or blending of amendments to reduce free liquids in soil before leaving the site. Excavated materials would be transported to a permitted thermal treatment facility or landfill. Approximately 2,540 cubic yards of sediment from the top foot over an area of 68,500 SF will be excavated. The total quantity of sediment to be excavated and sent off-site for treatment or disposal is estimated to be 4,610 tons.

When excavation is complete, a 12-inch subaqueous cap would be installed on excavated areas. Typically constructed of sand, the cap would be designed to provide chemical isolation, erosion control, and benthic habitat. In areas where visual impacts remain, a combined cap incorporating a six-inch reactive cap and a six-inch sand cap would be installed. The optimal composition of the reactive cap would be determined by a pre-design investigation. Typical reactive caps may be constructed using carbon or organoclay to contain NAPL or high concentrations of COC. There is an estimated 6,020 SF of sediment that has visual impacts greater than 1 foot in depth. The cofferdams and access road along the south will be removed, and the park and trail will be restored to their original condition with landscaping and planting.

OM&M activities which would be required once site construction is completed would include the following:

- Annual inspections of cap stability for five years
- Annual monitoring of cap performance for two years. After the initial two year period, monitoring would occur at year five
- Status report once per year

5.4.3.2 Overall Protection of Human Health and the Environment

Table 5-1 identifies which remedial technologies included in Alternative S-3 would meet the remedial action objectives for sediment. As the table shows, all RAOs associated with protectiveness of human health and the environment will be addressed by this alternative. Ingestion/direct contact with contaminated sediment exceeding remedial criteria would be addressed by excavation and capping.

Long term impacts to benthic organisms would be prevented by excavating the top foot of sediment and capping any areas where COC remain in the excavated area.

5.4.3.3 Compliance with SCGs

The primary action- and location-specific regulatory requirements potentially applicable to Alternative S-3 include the following:

- Requirements to avoid adverse impacts to floodplains – these will be addressed by returning the site to existing grade after excavation.
- Army Corps of Engineers and state regulations regarding dredging and filling regulations – A Joint Application for Permit must be prepared to secure Nationwide Permit 38 from the USACE to allow Cleanup of Hazardous and Toxic Waste from Waters of the United States as well as a protection of waters/401 Water Quality Permit issued by the New York State Department of Environmental Conservation. The design and the workplan will conform to the provisions of these permits.
- Requirements to dispose of waste material in accordance with NY solid waste management rules and guidance on management of MGP wastes – these will be addressed by sending MGP impacted waste to appropriately permitted landfills and thermal treatment facilities.
- Local ordinances concerning noise, permitting, and transportation – these will be addressed by restricting contractor's work practices in according with local requirements and obtaining required local permits.
- Occupational safety and health regulations for construction and hazardous waste site operations – these will be addressed by requiring the contractor to complete all work under the provisions of a site-specific HASP.
- Requirements for SPDES permitted discharge of water generated by dewatering – these will be addressed by meeting the substantive requirements of an SPDES discharge permit including treating water to meet discharge limits. Requirements for discharge to Publicly Owned Treatment Works (POTW) will be required to discharge treated waters into the Village of Penn Yan sanitary sewer system. An O&M Plan will be prepared to ensure compliance.
- Regulations concerning work near overhead power lines – these will be addressed by relocating or de-energizing power lines and equipment, providing shields, or ensuring work takes place outside of required clearances.
- Requirements for management of air emissions under the Clean Air Act and the NYSDOH – these will be addressed by implementation of a site HASP and a CAMP during remedial activities.

The design of this alternative will be prepared to address these requirements and to allow required permits to be obtained.

No Chemical-specific SCGs for sediment were identified; however the TBCs shown in Table 3-1 may be applicable in determining site-specific sediment objectives.

5.4.3.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is evaluated by considering COC remaining in impacted media once remedial construction is complete. Much of the heavily impacted sediment will be

removed by excavation of the top foot of sediment. The subaqueous cap will prevent future exposure pathways or risks to the public, continuing risk to ecological receptors or continuing impacts to the environment.

5.4.3.5 Reduction of Toxicity, Mobility, or Volume

The proposed scope of Alternative S-3 calls for excavation and backfill of impacted sediment in the top one foot between the site and the railroad bridge, and subaqueous capping of visibly impacted materials remaining after excavation. Given the concentrations of COC in sediment, some of the material excavated would be managed at an off-site thermal treatment facility. The remaining COC will be isolated by a 12-inch subaqueous cap. In areas where there is visible evidence of NAPL a reactive layer will be incorporated into the cap. This alternative achieves the program goal of reduction of volume through excavation and off-site treatment.

5.4.3.6 Short-Term Effectiveness

There are significant potential short-term risks associated with implementation of Alternative S-3, including the following:

- Risks to construction workers associated with exposure to COC and general construction and transport
- Risks to nearby residents and the community associated with dust, noise, and air emissions and truck traffic
- Damage to the benthic and fish communities due to loss of habitat during construction
- Risks to the environment associated with the potential release of COC during construction and disruption of benthic habitat during excavation

Those risks can be minimized using personal protective equipment and engineering controls.

5.4.3.7 Implementability

Implementation of sediment excavation/dredging presents several challenges that will need to be overcome. During installation of cofferdams turbidity control measures will be needed in open water to prevent significant impacts downstream. A pre-design investigation will be required to determine the geotechnical design parameters of the soils underlying the sediment to determine the final cofferdam layout and configuration. Access agreements for adjacent properties to install the cofferdams will be key to implementation of this alternative. To permit excavation south of the sheet pile wall an access road through the village owned park on the southern bank would be required. Excavation work in the lake outlet should occur during the low flow months of the year (July – October) if practical. Special design consideration will need to be taken regarding possible scour of the bank or sediment in the flow channel as velocities will approximately double during the excavation.

Excavation and offsite thermal treatment or landfill disposal of contaminated sediments can be implemented using conventional excavation equipment. Excavation of the area south of the outlet centerline will require access to Village of Penn Yan owned park to the south of the Keuka Lake outlet, and restoration of the park after completion of excavation activities. A stockpile area on the upland area of the site would be required for dewatering and/or blending of amendments to reduce soil moisture before leaving the site. The specific methods used for sediment pre-treatment will

depend on treatment/disposal facility acceptance requirements regarding moisture content and acceptable amendments.

Capping of visibly impacted material will be easily implemented in the open excavation. Final composition of the reactive cap will be dependent on a pre-design investigation. Possible sources of future disruption to the cap, such as dredging, will be identified and considered as part of the cap design.

There are six storm drain outfalls that discharge into the Keuka Lake outlet along the area of sediment remediation. These outlets would need to be plugged and the discharge re-routed outside the cofferdam during excavation, which will require agreements with the sewer owners.

Sediment excavation will require significant dewatering to manage the seepage of water around the cofferdams and flow from the ground water table. A temporary water treatment plant and discharge technology will be implemented during construction. Temporary pump and treat systems are routinely implemented, and can be implemented with relative ease at this site. It is anticipated that a 50 gpm treatment system will be sufficient for maintaining a dry excavation.

Odor management during the excavation may be necessary for successful implementation of the excavation alternative, due to the proximity to nearby residents. Odors can be managed through the use of odor control sprays and foams and by modifying work procedures.

Sediment excavation will require a number of local, state, and federal permits, which will require a significant lead time to obtain. Permitting for the excavation is expected to take approximately 6-12 months. Permitting activities would run concurrent with remediation design activities.

5.4.3.8 Cost Effectiveness

The total estimated cost for Alternative S-3 is $3,600,000. This cost includes $3,440,000 in capital costs and $160,000 present value of operation, maintenance and monitoring costs for the next 30 years. The capital cost includes a 20% contingency, engineering expenses and administrative fees. Tables 5-10 and 5-11 detail capital and OM&M costs, respectively. Details of these cost estimates are provided in Appendix C.

This alternative ranks moderate in long-term effectiveness because it meets RAOs for protection in human health and the environment but only partially addresses returning sediment impacts to background levels. It also leaves the majority of COC in sediment in place. For the same reason, it ranks moderate to low in reduction in toxicity, mobility, of volume in COCs. It is rated as moderate for short-term effectiveness because there are significant impacts during implementation which can be effectively controlled.

Over all, this alternative is evaluated as low to moderate in cost-effectiveness.

5.4.3.9 Land Use

See section 5.4.1.9 for the current and future land use of the Keuka Lake Outlet.

The proposed scope of work for alternative S-3 will remove the top foot of sediments and backfill with clean material. The existing biota should easily re-populate the remediated area. This alternative is

consistent with the current use of the outlet, as well as the recommended future use of the site under the waterfront revitalization plan.

5.4.4 Alternative S-4 – Full Excavation/Dredging of Impacted Sediment and Placement of Backfill

5.4.4.1 Description

Figure 5-6 shows the layout of Alternative S-4. Design elements of the alternative include the following:

- Excavation of impacted sediment above site-specific cleanup criteria
- Backfill of dredged areas to restore original bathymetry
- Off-site transportation of excavated material to a permitted thermal treatment facility

As part of Alternative S-4, sediment located between the site and the Keuka Lake outlet control structure with concentrations of COCs greater than site-specific cleanup criteria will be excavated. Cleanup criteria would be established using a three tier process as described in Section 3.4.4. The pre-design investigation required to establish cleanup criteria assumes that the sediment samples for all three tiers will be collected at the same time. In order to do this, Tier 2 pore water data will be analyzed within the holding times for aquatic toxicity testing. The Tier 1 assessment (screening level comparison) will be conducted from the total sediment PAH concentrations using the NOAA 34 list of PAH's. Samples will be collected from both surface sediment and deeper sediment samples. Samples from upstream of the site will be collected in order to develop more accurate values for background concentrations of COCs. The pre-design investigation may also include forensics analysis to determine the limit of site related impacts in relationship to the observed impacts from the stormwater outfalls.

Excavation would be conducted using conventional earth moving equipment. A temporary watertight sheet-pile cofferdam would be required to permit excavation as deep as the clay layer. As with the other sediment alternatives, alternate methods of sediment removal, including mechanical or hydraulic dredging, may be considered during design.

Dewatering and construction water treatment systems would be required to maintain dry conditions during excavation and backfill. The dewatering system would consist of pumps installed in sumps in the excavation. Water removed by the system would be piped to the construction water treatment system for removal of organic constituents and cyanide and then discharged to surface water. Removal and treatment rates would be determined during the pre-design investigation.

Sediment would be transported to an onsite soil staging area staging for dewatering and/or blending of amendments to reduce soil moisture before leaving the site. Excavated materials would be transported to a permitted thermal treatment facility or landfill. As shown in figure 5-6, it is estimated that approximately 80% of the sediments above the clay layer would be excavated over 41,430 square feet upstream of the railroad bridge. For cost estimate purposes, an additional 21,730 square feet south of the railroad bridge may also need to be excavated. Up to 6,690 CY would be excavated from the two areas. The total quantity of sediment to be excavated and sent off-site for treatment or disposal is estimated to be 11,040 tons. When excavation is complete, the cofferdams and the access road along the south will be removed, and the park and trail will be restored to their original condition with landscaping and planting.

5.4.4.2 Overall Protection of Human Health and the Environment

Table 5-1 identifies which remedial technologies included in Alternative S-4 would meet the remedial action objectives for sediment. As the table shows, all identified RAOs will be addressed by this alternative. Alternative S-4 will return to the site to background conditions.

5.4.4.3 Compliance with SCGs

The primary action- and location-specific regulatory requirements potentially applicable to Alternative S-4 include the following:

- Requirements to avoid adverse impacts to floodplains – these will be addressed by returning the site to existing grade after excavation.
- Army Corps of Engineers and state regulations regarding dredging and filling regulations – A Joint Application for Permit must be prepared to secure Nationwide Permit 38 from the USACE to allow Cleanup of Hazardous and Toxic Waste from Waters of the United States as well as a protection of waters/401 Water Quality Permit issued by the New York State Department of Environmental Conservation. The design and the workplan will conform to the provisions of these permits.
- Requirements to dispose of waste material in accordance with NY solid waste management rules and guidance on management of MGP wastes – these will be addressed by sending MGP impacted waste to appropriately permitted landfills and thermal treatment facilities.
- Local ordinances concerning noise, permitting, and transportation – these will be addressed by restricting contractor's work practices in according with local requirements and obtaining required local permits.
- Occupational safety and health regulations for construction and hazardous waste site operations – these will be addressed by requiring the contractor to complete all work under the provisions of a site-specific HASP.
- Requirements for SPDES permitted discharge of water generated by dewatering – these will be addressed by meeting the substantive requirements of an SPDES discharge permit including treating water to meet discharge limits. Requirements for discharge to Publicly Owned Treatment Works (POTW) will be required to discharge treated waters into the Village of Penn Yan sanitary sewer system. An O&M Plan will be prepared to ensure compliance.
- Regulations concerning work near overhead power lines – these will be addressed by relocating or de-energizing power lines and equipment, providing shields, or ensuring work takes place outside of required clearances.
- Requirements for management of air emissions under the Clean Air Act and the NYSDOH – these will be addressed by implementation of a site HASP and a CAMP during remedial activities.
- National and state historic preservation regulations – these will be addressed by determining if the abandoned railroad bridge is listed on a national or state historic register. Changes to the limit of excavation may be required to protect the bridge.

The design of this alternative will be prepared to address these requirements and to allow required permits to be obtained.

No Chemical-specific SCGs for sediment were identified; however the TBCs shown in Table 3-1 may be applicable in determining site-specific sediment objectives.

5.4.4.4 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is evaluated by considering COC remaining in impacted media once remedial construction is complete. Most of this material will be removed and transported to an off-site facility. The small amount of COC which would remain in sediment outside of the excavation area would pose minimal risk and should be effectively reduced by natural processes within a short period of time.

5.4.4.5 Reduction of Toxicity, Mobility, or Volume

The proposed scope of Alternative S-4 calls for excavation of all sediments with COC concentrations greater than site specific remedial criteria. Given the concentrations of COC in sediment, some of the material excavated would be managed at an off-site thermal treatment facility. For that reason, this alternative achieves the program goal of reduction of toxicity, mobility, or volume through treatment.

5.4.4.6 Short-Term Effectiveness

There are significant potential short-term risks associated with implementation of Alternative S-4, including the following:

- Risks to construction workers associated with exposure to COC and general construction and transport
- Risks to nearby residents and the community associated with dust, noise, and air emissions and truck traffic
- Damage to the benthic community due to loss of habitat during construction
- Risks to the environment associated with the potential release of COC during construction and disruption of benthic habitat during excavation

Those risks can be minimized using personal protective equipment and engineering controls. Alternative S-4 is expected to take approximately five months for completion, with greater short term risks that the other two sediment alternatives. Alternative S-4 has a greater potential damage to the benthic community than alternatives S-2 and S-3.

5.4.4.7 Implementability

Implementation of sediment excavation/dredging presents several challenges that will need to be overcome. During installation of cofferdams turbidity control measures will be needed in open water to prevent significant impacts downstream. A pre-design investigation will be required to determine the structural characteristics of the soils underlying the sediment to determine the final cofferdam layout and configuration. Special consideration will need to be taken around the abandoned railroad bridge. The bridge may need to be partially or fully demolished to permit cofferdam installation. Materials underneath the railroad bridge may need to be left in place to protect the bridge. Access agreements for adjacent properties to install the cofferdams will be key to implementation of this cofferdam option. To permit excavation south of the sheet pile wall an access road through the village owned park on the southern bank would be required. Excavation work in the lake outlet should to occur during the low flow months of the year (July – October) if practical. Special design consideration will need to be taken

regarding possible scour of the bank or sediment in the flow channel as velocities will approximately double during the excavation.

Excavation and offsite thermal treatment of contaminated sediments can be implemented using conventional excavation equipment. Excavation of the area south of the outlet centerline will require access to Village of Penn Yan owned park to the south of the Keuka Lake outlet, and restoration of the park after completion of excavation activities. A stockpile area on the upland area of the site would be required for dewatering and/or blending of amendments to reduce soil moisture before leaving the site. The specific methods used for sediment pre-treatment will depend on treatment facility acceptance requirements regarding moisture content and acceptable amendments.

There are twelve storm drain outfalls that discharge into the Keuka Lake outlet along the area of sediment remediation. These outlets would need to be plugged and the discharge re-routed outside the cofferdam during excavation, which will require agreements with the sewer owners.

Sediment excavation will require significant de-watering to manage the seepage of water around the cofferdams and flow from the ground water table. A temporary water treatment plant and discharge technology will be implemented during construction. Temporary pump and treat systems are routinely implemented, and can be implemented with relative ease at this site.

Odor management during the excavation would be a critical element for successful implementation of the excavation alternative, due to the proximity to nearby residents. Odors can be managed through the use of odor control sprays and foams or by modifying work procedures.

Sediment excavation will require a number of local, state, and federal permits, which will require a significant lead time to obtain. Permitting for the excavation is expected to take approximately 6-12 months. Permitting activities would run concurrent with remediation design activities.

5.4.4.8 Cost Effectiveness

The total estimated cost for Alternative S-4 is $5,300,000 in capital costs, no OM&M costs are anticipated for this alternative. The capital cost includes a 20% contingency, engineering expenses and administrative fees. Table 5-12 details capital costs. Details of these cost estimates are provided in Appendix C.

This alternative ranks high in both long-term effectiveness and reduction of toxicity, volume of mobility in COC because it addresses all RAOs, removes the majority of COCs and treats COC in sediment. It ranks moderate in terms of short-term effectiveness because there are significant impacts during construction which can be effectively controlled.

Overall this alternative is evaluated as cost effective because although its costs are high, the benefits in terms of meeting objectives are also high.

5.4.4.9 Land Use

See section 5.4.1.9 for the current and future land use of the Keuka Lake Outlet.

The proposed scope of work for alternative S-4 will return the site to background conditions. The existing biota should easily re-populate the remediated area. This alternative is consistent with the

current use of the outlet, as well as the recommended future use of the site under the waterfront revitalization plan.

5.5 Comparison of alternatives

After individual evaluation of each alternative based on eight of the nine criteria, comparative analyses have been conducted to evaluate the relative performance of each alternative. The purpose of the analyses is to identify the advantages and disadvantages of each alternative relative to the others so that key tradeoffs that must be balanced can be identified. Overall protection of human health and the environment and compliance with SCGs must be met by any selected alternative. Tradeoffs among the alternatives are related to six criteria: long-term effectiveness and permanence; reduction of toxicity, mobility and volume; short-term effectiveness; implementability; cost effectiveness; and land use. Community acceptance would be addressed following regulatory review and public hearings. The analyses are summarized in Table 5-13. This table ranks each alternative relative to all other alternatives by criteria. Separate evaluations have been performed for upland and sediment alternatives.

5.5.1 Comparative evaluation of upland alternatives

5.5.1.1 5.5.1.1 Overall protection of human health and the environment

As shown on the Table 5-13, Alternative U-1, the No Action alternative, is rated as not protective of human health and the environment. For that reason, it is not acceptable as a remedy for the site. The other three alternatives, which address all identified RAOs related to protectiveness and eliminate identified exposures, are rated as protective.

5.5.1.2 5.5.1.2 Compliance with SCGs

There are no SCGs that apply to Alternative U-1. The three active remedial alternatives, U-2, U-3, and U-4, involve significant regulatory requirements, including solid waste management, stormwater pollution prevention. SPDES discharge requirements, and permitting requirements for working in bodies of water. All of these requirements can be addressed during design and permitting. All four alternatives are evaluated as compliant with SCGs.

5.5.1.3 Long-term effectiveness and permanence

Alternatives U-3 and U-4 both include removal of the large majority of COC found at sediment at the site. For Alternative U-3, residual risks are small. These limited remaining risks will be easily addressed by institutional controls. Alternative U-4 is rated highest because more impacted material is removed. Alternative U-1 does not include any removal of impacted media and does not provide controls on exposure, so that it is rated lowest. Alternative U-2 does not include removal of a significant amount of impacted material, but does provide for effective controls. For that reason, it is rated more effective than No Action but less effective than the other removal alternatives.

5.5.1.4 Reduction of toxicity, mobility and volume

Alternative U-1 includes no treatment of COC so it is rated lowest. Alternative U-2 includes removal and treatment of some COC in soil and NAPL, but not a significant amount, so it is ranked third. Both Alternatives U-3 and U-4 include treatment of a large majority of the total mass of COC in the upland area. The two are rated very similar although Alternative U-4 is given a higher evaluation because a somewhat larger mass of COC is treated.

5.5.1.5 Short-term effectiveness

As described previously, there are no significant short-term risks at the site, so all four upland options are considered the same based on that factor. The four alternatives do have different impacts during construction. The No Action alternative has the least so this alternative is rated best. The other three alternatives have significant short-term impacts. Alternative U-2 is ranked second because the length of the schedule and the amount of traffic will be lower than alternative U-3 and U-4. Alternative U-3 is also ranked higher than U-4 because risks associated with community disruption, lower truck traffic, and potential for release of COC are lower. Short-term risks associated with all the alternatives can be addressed using personal protective equipment, site controls, and engineering controls.

5.5.1.6 Implementability

All of the alternatives except U-1 have issues with Implementability associated with community impacts and working in tight quarters. The No Action alternative is rated highest for this evaluation. Alternative U-4 is rated lowest because of the significant space constraints associated with removal of soil across the entire site. . Alternative U-3 is rated lower than U-2 due to the need for sheet pile shoring to protect the former MGP building.

5.5.1.7 Cost Effectiveness

Total cost ranges and cost effectiveness evaluations for the four alternatives are shown on Table 5-13.

Alternative U-1 is evaluated as not cost effective because it is not effective in the long- or short-term and does not provide treatment of COC. Alternatives U-2, U-3, and U-4 are all considered cost effective. Alternative U-3 is ranked highest by this criterion because it is effective in meeting all RAOs at a reasonable cost. Alternatives U-2 and U-4 are ranked lower than U-3 and equal in cost effectiveness. U-2 does not meet all RAOs, but is much less expensive than the other alternatives. U-4 is the most effective alternative, but the limited improvement in effectiveness does not justify the significantly higher cost.

5.5.1.8 Land Use

Alternative U-1 is ranked lowest by this criteria because it will not allow use of the site for commercial purposes, its most likely future use. Alternative U-2 will allow use for its intended purpose and is ranked third. Alternative U-3 is ranked higher than U-2 because it will allow the site to be used as intended with a less restrictive environmental easement. Alternative U-4 is ranked highest because it will allow an unrestricted range of potential site use, including residential without institutional controls.

5.5.2 Comparative evaluation of sediment alternatives

5.5.2.1 Overall protection of human health and the environment

As shown on Table 5-13, all the sediment alternatives except S-1 are rated as protective of human health and the environment and so are acceptable for consideration at the Penn Yan site. Alternative S-1 does not meet any RAOs and is not considered protective.

5.5.2.2 Compliance with SCGs

All of the active alternatives: S-2, S-3, and S-4; involve significant regulatory requirements including requirements for construction in sediment areas and occupational safety and health requirements. All

of these requirements can be addressed during design and permitting. No SCGs have been identified that apply to Alternative S-1. All four alternatives are evaluated as equally compliant with SCGs.

5.5.2.3 Long-term effectiveness and permanence

Alternatives S-2, S-3 and S-4 all include removal of the COC found in the sediment area and are considered effective in meeting RAOs. Following implementation of S-3, most of the COC currently found in sediment will remain. For that reason, it is rated lower than the other two alternatives on this criterion. The most significant mass of COC in sediment is found in the visually impacted material, which will be removed by both alternatives S-2 and S-4. Alternative S-4 is rated marginally higher than S-2 because a marginally higher mass of COC may be removed.

5.5.2.4 Reduction of toxicity, mobility and volume

Alternative S-1 does not include any removal or treatment of COC, and so is rated lowest. Alternatives S-2, S-3 and S-4 all include removal of the COC in the outlet. As indicated previously, Alternatives S-2 and S-4 are rated significantly better than S-3 because they both remove all visually impacted sediment, where the greatest mass of COC is found. Alternative S-4 is rated marginally higher than S-2 because some additional COC may be removed.

5.5.2.5 Short-term effectiveness

None of the four alternatives for sediment address risks in the short term and are considered equal. The four alternatives do have different impacts during construction. The no action alternative has the least so it is rated highest. The other three alternatives have significant short-term impacts which are similar. Alternative S-3 is rated second because its schedule is shorter and there are fewer impacts from traffic and less potential for release of COC. For the same reason, Alternative S-2 is rated somewhat higher than S-4.

5.5.2.6 Implementability

Each of the alternatives except S-1 has significant issues with implementability associated with providing access to the outlet area, rerouting utilities, installation of shoring, and others. For that reason, the No Action alternative is rated highest. Implementation issues for Alternatives S-2, S-3 and S-4 are similar so that these alternatives are rated the same by this criterion.

5.5.2.7 Cost Effectiveness

Total cost ranges for the four alternatives are shown on Table 5-13. Alternative S-1 is rated as not cost effective and is rated lowest. Alternatives S-2 and S-4 are both ranked high for cost effectiveness. Alternative S-2 is considered more cost effective because the additional costs associated with Alternative S-4 are not matched by a comparable increase in effectiveness.

5.5.2.8 Land Use

Alternative S-1 does not address land use issues related to COC in sediment in the outlet. The other three alternatives have all been evaluated as allowing future use which is consistent with the village's waterfront revitalization plan. These three alternatives are rated the same.

6.0 Recommended remedial alternative

Based on the evaluation completed in Section 5, recommended alternatives for the upland and sediment parts of the site have been identified. These have been combined into a single site-wide alternative which addresses exposures and RAOs for the entire site.

6.1 Description of recommended remedial alternative

Figure 6-1 shows the recommended combined upland/sediment remedial action for the Penn Yan site. The remedy combines Alternatives U-3 (Excavation of Surface Soil and Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater) and S-2 (Excavation/Dredging of Surface Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR). A detailed description of the remedial construction activities required to implement this remedial action is presented in Sections 5.3.3.1 and 5.4.2.1. The estimated cost range for the combined remedial action is between $4,010,000 and $8,600,000. These costs are somewhat lower than the sum of the costs for implementation of those two alternatives separately because of cost savings from reduction in costs for mobilization and oversight costs when the alternatives are combined.

6.2 Basis for recommendation

Table 5-13 shows the comparative ranking of all remedial alternatives for each of the eight evaluation criteria. All of the alternatives except U-1 were rated as protective and compliant with SCGs. Because U-1 is not rated as protective, it cannot be selected for implementation. Selection among remaining remedial alternatives that have been rated protective and compliant with SCGs is made by determining which has the best balance among the other seven evaluation criteria; long-term effectiveness, reduction in COC through treatment, short-term effectiveness, implementability, cost effectiveness, and land use.

Among the acceptable upland alternatives, Alternatives U-3 and U-4 are rated very similar and significantly higher than U-2 in terms of their ability to reliably remove residual risks and impacts at the site and to meet RAOs. With both U-3 and U-4, very little COC is left when implementation is complete. Although U-4 would remove the most COC, it would provide only a marginal benefit in COC removal when compared to U-3. Alternative U-2 is significantly less effective because it does not remove most of the COC in subsurface soil.

In terms of implementability and short-term effectiveness, Alternative U-2 is rated highest, while U-3's ranking is similar to that for U-4. Since no short-term risks have been identified in the upland portion of the site, the only difference between the alternatives is in impacts during construction. Although Alternatives U-3 and U-4 are rated lower for this factor, any issues related to impacts during construction can be addressed during design and by using construction controls. Similarly, Alternative U-2 is ranked highest for implementability, but no implementability issues have been identified which cannot be addressed during design.

Although Alternative U-2 costs less than U-3 and U-4, it is considered significantly less cost effective. Alternative U-4 costs significantly more than Alternative U-3 and is considered less cost effective. Based on this evaluation, Alternative U-3 is rated higher on balance than Alternatives U-2 and U-4 and is selected as the recommended alternative.

All sediment remedial alternatives other than Alternative S-1 are rated as protective and compliant with SCGs. Alternatives S-2 and S-4 are given high ratings for long-term effectiveness and permanence, and reduction in toxicity, mobility, and volume through COC removal. Although S-4 would potentially remove the most COC, it would only provide a marginal benefit in effectiveness when compared to S-2.

Alternative S-3 is rated somewhat higher for short-term effectiveness because of fewer construction impacts. These impacts can effectively be addressed during design. Alternative S-4 is ranked marginally higher than alternative S-2 in terms of overall effectiveness.

Alternative S-3 is rated somewhat higher than Alternatives S-2 and S-4 in terms of implementability. As discussed above for short-term effectiveness, all of the implementability issues can be addressed during design and construction. All three active alternatives are rated high in achieving land use goals. Alternative S-2 is rated higher than Alternatives S-3 and S-4 in terms of cost effectiveness. Based on this evaluation, Alternative S-2 is rated higher on balance than Alternatives S-3 and S-4 and selected as the recommended alternative for sediment.

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Tables

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Table 3-1
Chemical-Specific Standards, Criteria, and Guidance
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Media	Requirements	Citation	Description	SCG or TBC	Comment
Soil	NYSDEC Soil Cleanup Objectives (SCOs) for Inactive Hazardous Waste Sites	NYSDEC HWR-94-TAGM 4046	Establishes recommended soil cleanup objectives, soil cleanup objectives for protection of groundwater quality, and groundwater standards/criteria	TBC	Specified screening-level goals may be applicable in determining site-specific soil objectives.
	NYSDEC Remedial Program Soil Cleanup Objectives (SCOs)	6 NYCRR Part 375 Subpart 375-6	Establishes soil screening-level objectives based on residential, commercial, and industrial land use; protection of ecological resources; and protection of groundwater quality	SCG	Specified screening-level goals may be applicable in determining site-specific soil objectives.
Groundwater	NYSDEC Groundwater Objectives	6 NYCRR Part 700-706 NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5	Establishes guidance or standard values for groundwater quality objectives	SCG	May be applicable in determining site-specific groundwater objectives.
Sediment	NYSDEC Sediment Quality Criteria development process	Technical Guidance for Screening Contaminated Sediments (NYSDEC 1999).	Describes process for developing sediment quality criteria in the State of New York.	TBC	May be applicable in determining site-specific sediment objectives.
	USEPA Sediment Quality Criteria development process	*Evaluating Ecological Risk to Invertebrate Receptors From PAHs in Sediments at Hazardous Waste Sites (USEPA 2009)*	Describes an updated process for developing sediment quality criteria.	TBC	May be applicable in determining site-specific sediment objectives.
	SCUBA methods		Describes an updated process for developing sediment quality criteria.	TBC	May be applicable in determining site-specific sediment objectives.

Notes:
SCG = Standards, Criteria, and Guidance
TBC = Other Criteria To Be Considered

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Table 3-2
Action-Specific Standards, Criteria, and Guidance
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Action	Requirements	Citation	Description	SCG or TBC	Comment
Water Treatment Discharge	NYSDEC Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations	Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1, 1.1.2	Compilation of ambient water quality standards and guidance values for toxic and non-conventional pollutants for use in NYSDEC programs (i.e., SPDES)	TBC	These standards and guidance values are applicable in establishing discharge limitations to surface waters.
	NYSDEC Industrial SPDES Permit Drafting Strategy for Surface Waters	TOGS 1.2.1	Guidance for developing effluent and monitoring limits for point source releases to surface water	TBC	These standards and guidance values are applicable in establishing discharge limitations to surface waters .
	Clean Water Act	Section 401	Water Quality Certification	SCG	Potentially Applicable
	SPDES	6 NYCRR Parts 750-01, 750-02	Requirements for obtaining a SPDES permit and requirements for operating in accordance with a SPDES permit	SCG	Potentially Applicable to constructing and operating a water treatment system for discharge to surface water
	Town Sewer Division	TOGS 1.3.8	Limits on new or changed discharges to Publicly Owned Treatment Works (POTWs), strict requirements regarding bioaccumulative and persistent substances, plus other considerations	TBC	Potentially Applicable to constructing and operating a water treatment system for discharge to Publicly Owned Treatment Works
Construction Stormwater	SPDES Permit	NYSDEC SPDES General Permit for Stormwater Discharge	Requirements to protect stormwater from construction impacts including preparation of a stormwater Pollution Prevention Plan (SWPPP)	SCG	Not applicable. Land disturbance area is less than one acre.
In Situ Treatment of Soils and Groundwater	Underground Injection Control Program	40 CFR Part 144	Includes requirements for injection of chemicals	SCG	Potentially Applicable for In Situ Chemical Oxidation.
	NYSDEC Ambient Water Quality Standards and Guidance Values	Division of Water Technical and Operational Guidance Series (TOGS) 2.1.2	Applicability of SPDES permits and groundwater effluent standards to the use of underground injection/recirculation as a remediation measure.	SCG	Potentially Applicable
Indoor Air	NYSDOH Background Air Levels	Draft Guidance for Evaluating Soil Vapor Intrusion in the State of New York	Includes a database of background indoor air concentrations and description of decision making process for remediation of indoor air impacts.	TBC	Not applicable. No exposures have been identified
Waste Management	Solid Waste Management Facility	6 NYCRR 360	Includes solid waste management facility requirements	SCG	Applicable if soil or sediment are removed
	Waste Transporter Permits	6 NYCRR 364	Regulates collection, transport and delivery of regulated waste. Requires that wastes be transported by permitted waste haulers.	SCG	Applicable if soil or sediment are removed
		TAGM 4032	Disposal of Drill Cuttings	SCG	Potentially Applicable during the installation of injection points or new monitoring wells.
MGP-Impacted Soil and Sediment	Management of soil and sediment contaminated with coal tar from Manufactured Gas Plants	NYSDEC TAGM 4060 and NYSDEC TAGM 4061 (DER-4)	This guidance outlines the criteria for MGP coal tar waste. Soils and sediment only exhibiting the toxicity characteristic for benzene (D018) may be conditionally excluded from the requirements of 6 NYCRR Parts 370-374 and 376 when they are destined for permanent thermal treatment	SCG	Applicable for off-site treatment and disposal of soil and sediment.
Hazardous Waste	**Federal:** *Resource Conservation and Recovery Act (RCRA) Subtitle C – Hazardous Waste Management*				
	Generation, Management, and Treatment of Hazardous Waste	40 CFR Parts 261-265	Outlines criteria for determining if a solid waste is a hazardous waste and establishes requirements for hazardous waste management.	SCG	Because of New York State policy for management of wastes from MGP sites, no hazardous wastes will be generated as part of implementation of the remedial actions. Not Applicable.
	State: NYSDEC Division of Hazardous Substances Regulation				
	New York State Hazardous Waste Management Regulations	6 NYCRR Parts 370-376	Outlines criteria for determining if a solid waste is a hazardous waste and establishes a hazardous waste management program.	SCG	Because of New York State policy for management of wastes from MGP sites, no hazardous wastes will be generated as part of implementation of the remedial actions. Not Applicable.
Off-site Management of Non-hazardous Waste	RCRA Subtitle D	42 U S C Section 6901 *et seq.*	State and local governments, in accordance with EPA's guidance, are the primary planning, regulating, and implementing entities for the management of non-hazardous solid waste, such as household garbage and non-hazardous industrial solid waste	SCG	Applicable if soil or sediment are removed from site.
Air Emissions	*Clean Air Act (CAA)*				
	New Source Review (NSR) and Prevention of Significant Deterioration (PSD) Requirements	40 CFR Part 52	New sources or modifications which emit greater than the defined threshold for listed pollutants must perform ambient impact analysis and install controls which meet best available control technology (BACT)	SCG	Not applicable. No new sources will be generated
	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR Part 61; 40 CFR Part 63	Source-specific regulations which establish emissions standards for hazardous air pollutants (HAPs)	SCG	Not applicable.
	New York State Air Pollution Control Regulations	6 NYCRR Parts 120, 200-203, 207, 211, 212, 219, Air Guide-1	Establishes emissions standards and permitting requirements for new sources of air pollutants and specific contaminants	SCG	Requirements would be applicable to remediation alternatives that result in emissions of air contaminants, including particulate matter and toxic air contaminants.
	New York State Ambient Air Quality Standards	6 NYCRR Part 257	Establishes state ambient air quality standards and guidelines for protection of public health	SCG	May be applicable in evaluating air impacts during remediation activities. Establishes short-term exposure action limits for occupational exposure.
	Fugitive dust suppression and particulate monitoring	NYSDEC HWR-89-TAGM 4031	Fugitive dust suppression and particulate monitoring during source area remedial activities	SCG	For implementation under a site health and safety plan and Community Air Monitoring Plan during remedial activities. Applicable to site disturbance activities.

Table 3-2
Action-Specific Standards, Criteria, and Guidance
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Action	Requirements	Citation	Description	SCG or TBC	Comment
Air Emissions	Community Air Monitoring Plan (CAMP)	NYSDOH	Air Quality Requirements	SCG	Applicable to site construction activities.
Work Near Overhead Power Lines	Safety and Health Regulations for Construction	Occupational Safety and Health Administration (OSHA) 29 CFR Part 1926, Subpart K; Part 1926.550(a)(15)	Establishes minimum clearances and grounding requirements for work near electrical equipment and for the operation of cranes and derricks in the vicinity of electrical distribution and transmission lines.	SCG	The minimum required clearances will be maintained and equipment grounding will be established when work is performed in the vicinity of overhead power lines.
	Worker Protection - Safety and Health	New York State Department of Labor (NYSDOL) High-Voltage Proximity Act, Code Rule 57, Section 202-h	Establishes minimum clearances and grounding requirements for work near high-voltage power lines	SCG	The minimum required clearances will be maintained and equipment grounding will be established when work is performed in the vicinity of overhead power lines.
Institutional Controls	Institution of an Environmental Easement	NYSDEC Policy on Environmental Easements: Environmental Conservation Law (ECL) Article 71, Title 36	NYSDEC has developed a draft standard form and procedure for establishing environmental easements	TBC	Institutional controls will be established in accordance with NYSDEC policy
Monitored Natural Attenuation	Provides specific requirement for implementation of MNA	*Use of MNA at Superfund, RCRA Corrective Action and UST Sites* (USEPA, 1997)	This guidance document establishes the technical basis for implementing MNA	TBC	Monitored Natural attenuation will be implemented in accordance with USEPA guidance
Site Management Plan (SMP)	Template document intended to expedite development and approval of a site-specific SMP by providing format and general content guidelines.	*Site Management Plan Template* (NYSDEC, April 2009)	NYSDEC has developed a Site Management Plan template for remedial projects performed under the management of the NYSDEC Division of Environmental Remediation.	TBC	An SMP will be utilized following remedial action, to address the means for implementing the Institutional Controls and Engineering Controls that will be required by an Environmental Easement for the site.
Land Disturbing Activities	Excavation or dredging of impacted soil or sediment	Draft DER-10; Technical Guidance for Site Investigation and Remediation	Requirements for collection and analysis of compliance and documentation samples.	TBC	Applicable
			Requirements for CAMP implementation	TBC	Applicable
	Backfill or subaqueous cap placement	Draft DER-10; Technical Guidance for Site Investigation and Remediation	Requriements for procedures to ensure that imported backfill is not impacted by COC.	TBC	Applicable
	Backfill	Draft DER-10; Technical Guidance for Site Investigation and Remediation	Requriements for procedures to ensure that imported backfill is not impacted by COC.	TBC	Applicable

Notes:
SCG = Standards, Criteria, and Guidance
TBC = Other Criteria To Be Considered

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Table 3-3
Location-Specific Standards, Criteria, and Guidance
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Location	Requirements	Citation	Description	SCG or TBC	Comment
Entire Site	Yates County	General regulations	County transportation and site use regulations	TBC	Requirements of County, Town, and Village would be applicable to all remediation alternatives, especially those requiring transportation.
		Redevelopment Plans	Yates County/Penn Yan waterfront revitalization master plan.	TBC	The master plan for redevelopment will have to be considered when considering future land use at the site.
	Village of Penn Yan	General ordinances	Village regulations regarding transportation, noise, zoning, building permits, etc.	TBC	Requirements of County, Town, and Village would be applicable to all remediation alternatives, especially those requiring transportation.
Floodplains	Executive Order 11988 - Floodplain Management	40 CFR Part 6, Subpart A; 40 CFR Part 6.302	Activities taking place within floodplains must be done to avoid adverse impacts and preserve the beneficial values in floodplains	SCG	Applicable
	Floodplain Management Regulations	6 NYCRR Part 500	Establishes floodplain management requirements	SCG	Applicable
	100-year floodplain regulations	Federal Emergency Management Agency	Administers floodplain management requirements	SCG	Applicable
Wetlands/Waters of the U.S.	Executive Order 11990 - Protection of Wetlands	40 CFR Part 6, Subpart A	Activities taking place within wetlands must be done to avoid adverse impacts	SCG	Not applicable. No wetlands are present at the site.
	Dredging and Filling regulations	Clean Water Act, Section 404; Rivers and Harbors Act	Regulates the discharge of dredged or fill material into waters of the United States. Requires a permit from the ACOE.	SCG	Applicable, work must be completed in accordance with permit conditions
	Wetlands regulations	NYSDEC Freshwater Wetlands Act	Regulates use and development of freshwater wetlands	SCG	Not applicable. No wetlands are present at the site.
	Protection of water regulations	6 NYCRR Part 608	Protection of Water Permit/ Water Quality Certification	SCG	Applicable.
Critical Habitat	Endangered Species Act and Fish and Wildlife Coordination Act	16 USC 661; 16 USC 1531	Actions must be taken to conserve critical habitat in areas where there are endangered or threatened species.	SCG	No endangered or threatened species were identified at the site. Not applicable.
Historic Preservation	National Historic Preservation Act	16 USC 470	Establishes requirements for the identification and preservation of historic and cultural resources.	SCG	Applicable to the management of historic or archeological artifacts identified on the site. A "No Findings" determination is required prior to excavation.
	New York State Department of Parks, Recreation, and Historic Preservation	Historic Preservation Act	Establishes requirements for the identification and preservation of historic and cultural resources.	SCG	Applicable to the management of historic or archeological artifacts identified on the site. A "No Findings" determination is required prior to excavation.

Notes:
SCG = Standards, Criteria, and Guidance
TBC = Other Criteria To Be Considered

Table 3-4
Remedial Action Objectives
NYSEG- Penn Yan Former MGP Site – Penn Yan, New York

Media	RAO for:	Remedial Action Objective
Surface Soil	Public Health Protection	• Prevent ingestion/direct contact with contaminated surface soils. • Prevent inhalation of or exposure to contaminants in surface soil
Subsurface Soil	Public Health Protection	• Prevent ingestion/direct contact with contaminated subsurface soils. • Prevent migration of contaminants that would result in groundwater or surface water contamination. • Eliminate through removal, treatment and/or containment source areas in soil, to the extent practicable.
Groundwater	Public Health Protection	• Prevent ingestion/direct contact with contaminated groundwater. • Prevent contact with or inhalation of volatiles from contaminated groundwater
	Protection of the Environment	• Remove and/or treat the source of groundwater contamination to the extent practicable. • Prevent potential migration of contaminated groundwater to the extent practicable. • Prevent the discharge of contaminants to surface water • Restore the groundwater aquifer to predisposal/ prerelease conditions to the extent practicable.
Free Product/ NAPL	Protection of the Environment	• Remove free product/NAPL identified at the site to the extent practicable. • Prevent and/or eliminate any free product/NAPL seeps which result in visual sheens on surface water to the extent practicable. • Eliminate through removal, treatment and/or containment the free product/NAPL as source of contamination of environmental media, to the extent practicable.
Sediment	Public Health Protection	• Prevent ingestion/direct contact with contaminated sediment
	Protection of the Environment	• Prevent impacts to benthic organisms from exposure to sediments containing site-related contaminants causing toxicity • Restore, to the extent practicable, site-impacted sediments to site background conditions
Soil Vapor	Public Health Protection	• Mitigate impacts to public health resulting from the potential for soil vapor intrusion into future on-site buildings

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Table 4-1
Initial Technology Screening for Groundwater
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Screening Evaluation
No Action	No Action	No Action	No additional remedial action	Consideration of a No Action alternative is required by DER-10. Retained for further evaluation.
Institutional Controls	Institutional Controls	Environmental Easement	Provides a legal agreement between the property owner and NYSDEC to restrict future site use. Can be used to implement a site management plan which describes work procedures required to manage any remaining site impacts.	Will be required unless all groundwater is returned to required cleanup levels. Retained for further evaluation.
		Local Ordinance	Legal restriction preventing installation of new wells or use of new wells.	Commonly used in municipalities which have a public water system. Retained for further evaluation.
In-Situ Treatment	Natural Attenuation	Monitored Natural Attenuation (MNA)	Groundwater remediation achieved by naturally occurring physical, chemical, and biological processes.	Commonly used for groundwater remedies which do not immediately meet groundwater cleanup criteria for organic COC. Retained for further evaluation.
	Immobilization	In-Situ Solidification (ISS)	Soil is solidified by mixing with cement or other admixture material.	Has been used to immobilize COC and NAPL at MGP sites in New York. Retained for further evaluation.
	Biological Treatment	In-Situ Bioremediation	Natural biological processes are enhanced to promote treatment of organic COC.	Effective in areas of low COC concentrations. Retained for further evaluation.
		Phytoremediation	Trees or other plants are placed to remove groundwater and immobilize or treat COC.	COC in groundwater found at depths up to 12 feet. Not retained for additional evaluation.
	Physical Treatment	Air Sparging	Air is injected into the aquifer to promote biodegradation and volatilized VOCs.	Not a suitable technology for treatment of PAHs. Not retained for further evaluation.
		In Situ Soil Flushing	Injection and extraction of surfactant to remove COC and NAPL in soil.	Groundwater contamination is located adjacent to Keuka Lake outlet, downgradient groundwater extraction is not technically feasible. Not retained for further evaluation.
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	Chemical oxidant is injected to treat organic COC.	Has been used to treat COC at MGP sites in New York. Retained for further evaluation.
	Thermal Treatment	Thermal	Subsurface material is heated to volatilize and treat organic COC.	Currently being implemented at an MGP site in New York. Retained for additional evaluation.
Removal	Groundwater Recovery	Extraction Wells	Extraction of ground water using wells with pumps in stalled.	Groundwater contamination is located adjacent to Keuka Lake outlet, downgradient groundwater extraction is not technically feasible. Not retained for further evaluation.
		Extraction Trench	Extraction of ground water using a gravel filled trench.	Considered equivalent to extraction wells. Not retained for further evaluation.
	NAPL Recovery	NAPL Extraction Wells	Extraction of NAPL from wells using pumps or skimmers.	No mobile NAPL has been identified. Not retained for further evaluation.
		Dual Phase Extraction	Extraction of water and NAPL from wells at the same time to enhance NAPL recovery.	No mobile NAPL has been identified. Not retained for further evaluation.
		Vacuum enhanced NAPL Recovery.	Use of a vacuum to increase the flow of NAPL to extraction wells.	No mobile NAPL has been identified. Not retained for further evaluation.
	Excavation	Excavation	Removal of soil using a hydraulic excavator or other excavation equipment. For deeper excavations, it is likely that shoring and dewatering operations will be required as part of excavation.	Common remedy for soil containing COC. Retained for further evaluation.
Treatment	Organic Treatment	Air Stripping	Air is used to volatilize VOCs in groundwater so that they can be removed, collected, and treated.	Potentially feasible for use in water treatment at the site. Specific unit processes for treatment of organic COC in groundwater will be evaluated during design. Generic organic water treatment is retained for additional evaluation.
		Granular Activated Carbon	Treatment by adsorption of COC on carbon.	Potentially feasible for use in water treatment at the site. Specific unit processes for treatment of organic COC in groundwater will be evaluated during design. Generic organic water treatment is retained for additional evaluation.
	Inorganic Treatment	Chemical/UV Oxidation	Groundwater treatment using ion exchange resins that remove ionized inorganic COC from water.	Potentially feasible for use in water treatment at the site. Specific unit processes for treatment of organic COC in groundwater will be evaluated during design. Generic organic water treatment is retained for additional evaluation.

Table 4-1
Initial Technology Screening for Groundwater
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Screening Evaluation
Treatment (continued)	Inorganic Treatment (continued)	Oil/Water Separation	Removal of NAPL from extracted water using gravity separation.	Potentially feasible for use in water treatment at the site. Specific unit processes for treatment of organic COC in groundwater will be evaluated during design. Generic organic water treatment is retained for additional evaluation.
		Chemical Precipitation	Addition of coagulants to water to promote precipitation of inorganic COC.	Potentially feasible for use in water treatment at the site. Specific unit processes for treatment of inorganic COC in groundwater will be evaluated during design. Generic inorganic water treatment is retained for additional evaluation.
		Ion Exchange/Adsorption	Use of equipment to remove and treat COC in groundwater.	Potentially feasible for use in water treatment at the site. Specific unit processes for treatment of inorganic COC in groundwater will be evaluated during design. Generic inorganic water treatment is retained for additional evaluation.
		Filtration	Use of a filter to remove COC absorbed to particulates.	Potentially feasible for use in water treatment at the site. Specific unit processes for treatment of inorganic COC in groundwater will be evaluated during design. Generic inorganic water treatment is retained for additional evaluation.
		Peroxide oxidation	Addition of hydrogen peroxide to water to treat inorganic constituents, particularly cyanide.	Potentially feasible for use in water treatment at the site. Specific unit processes for treatment of inorganic COC in groundwater will be evaluated during design. Generic inorganic water treatment is retained for additional evaluation.
Discharge	Groundwater Discharge	Discharge to a local Publicly-Owned Treatment Works (POTW)	Water is discharged to a sanitary sewer for conveyance to a POTW.	Common method for removal of treated or untreated groundwater. Retained for further evaluation.
		Discharge to Surface Water via Storm Sewer	Treated water is discharged to surface water.	Common method for removal of treated groundwater. Retained for further evaluation.
Containment	Process Barriers	Biological Containment	Containment is provided by installing air sparging wells around areas identified as sources of contamination to groundwater. Contaminants in groundwater are treated by in situ bioremediation. This technology treats contaminated water before it migrates off-site.	Potentially effective for containment of COC in groundwater Retained for further evaluation
		Permeable Reactive Barrier	Treatment chemical is mixed with soil in order to prevent migration of COC in groundwater.	Potentially effective for containment of COC in groundwater Retained for further evaluation
		Hydraulic Containment	Containment is provided by installing groundwater extraction wells or trenches around areas identified as sources of contamination to groundwater. Water is pumped to a treatment system for discharge to surface water or POTW. This technology captures contaminated water before it migrates off-site.	Groundwater contamination is located adjacent to Keuka lake outlet, downgradient groundwater extraction is not technically feasible. Not retained for further evaluation.
	Barrier Wall	Sheet Pile Wall	Driven steel piles used to create a barrier.	Has been selected for use to contain COC and NAPL at MGP sites in New York. Retained for further evaluation.
		Slurry Wall	Low permeability bentonite/soil wall installed in an excavated trench	Considered equivalent to a sheet pile wall. Will not be evaluated further, but may be considered during design if a barrier wall alternative is selected. Not retained for further evaluation.
		Jet Grouting	Low permeability soil/grout wall installed using an injection system.	Considered equivalent to a sheet pile wall. Will not be evaluated further, but may be considered during design if a barrier wall alternative is selected. Not retained for further evaluation.
		Solidified Earth Wall	Low permeability soil/grout wall installed using an auger or excavation equipment	Considered equivalent to a sheet pile wall. Will not be evaluated further, but may be considered during design if a barrier wall alternative is selected. Not retained for further evaluation.

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Table 4-2
Initial Technology Screening for Soil
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response	Remedial Technology	Technology Process Option	Description	Screening Evaluation
No Action	No Action	No Action	No additional remedial action.	Consideration of a No Action alternative is required by DER-10. Retained for further evaluation.
Institutional/ Engineering Controls	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. An easement can also be used	Will be required unless all soil is cleaned up to unrestricted use levels. Retained for further evaluation
		Zoning Ordinance	Legal restriction on specific site use.	Ordinance does not provide reliable long-term prevention of exposure. Not retained for further evaluation.
	Engineering Controls	Barriers/fencing	Construction of a fence to prevent site access.	Effective to prevent direct contact with surface soill. Not effective for subsurface soil. Retained for further evaluation for surface soil.
Removal	Excavation	Excavation	Removal of soil using a tracked or wheeled hydraulic excavator or other excavation equipment. For deeper excavations, it is likely that shoring	Common remedy for soil containing COC. Retained for further evaluation
In-Situ Treatment	Immobilization	In-Situ Solidification (ISS)	Soil is solidified by mixing with cement or other admixture material.	Has been used to treat subsurface soil at MGP sites in New York. Retained for further evaluation for subsurface soil.
	Biological Treatment	In-Situ Bioremediation	Natural biological processes are enhanced to promote treatment of organic COC.	Potentially effective for subsurface soil with moderate concentrations of COC. Retained for further evaluation.
		Phytoremediation	Trees and other plants are used to remove and immobilize COC in groundwater.	Not effective for surface soil. Not effective for subsurface soil with NAPL, staining, sheens, or high concentrations of COC. Not retained for further evaluation.
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	Injection of chemical oxidants to treat organic COC.	Has been used to treat contaminated subsurface soil at MGP sites in New York. Retained for further evaluation.
	Physical Treatment	Soil Vapor Extraction	Use of a blower to extract and treat VOCs in soil.	Not effective against PAHs or other SVOCs. Not retained for further evaluation.
		In Situ Soil Flushing	Injection and extraction of surfactant to remove COC and NAPL in soil.	Not feasible for treatment of soil in areas near surface water. Not retained for further evaluation soil.
	Thermal Treatment	Thermal	Soil is heated to volatilize and treat organic COC.	Currently being implemented for subsurface soil at an MGP site in New York. Retained for additional evaluation for subsurface soil.
Containment	Barrier Wall	Sheet Pile Wall	Driven steel piles used to create a barrier.	Containment remedies are not effective for reducing exposures to COC in soil. Not retained for further evaluation.
		Slurry Wall	Low permeability bentonite/soil wall installed in an excavated trench.	Containment remedies are not effective for reducing exposures to COC in soil. Not retained for further evaluation.
	Capping	Jet Grouting	Low permeability soil/grout wall installed using an injection system.	Containment remedies are not effective for reducing exposures to COC in soil. Not retained for further evaluation.
		Solidified Earth Wall	Low permeability soil/grout wall installed using an auger or excavation equipment.	Containment remedies are not effective for reducing exposures to COC in soil. Not retained for further evaluation.
		Soil Cover	Placement of a layer of clean soil to prevent contact with surface soil. A soil cover usually also includes placement of topsoil and seeding or	Effective to address COC in surface soil. Retained for further evaluation.
		Asphalt Pavement	Placement of asphalt pavement to prevent contact with surface soil.	Effective to address COC in surface soil. Considered equivalent to a soil cover. Not retained for further evaluation. Will be considered for use during design if capping of surface soil is selected
		Engineered Cap	Low permeability cap constructed with clay or plastic hydraulic barrier layers.	No more effective than a soil cover to address COC in surface soil. More difficult to implement and maintain and more expensive. Not retained for further evaluation.
Waste Management	Off-site Disposal or Treatment	Off-site Landfill	Disposal at a permitted off-site landfill.	Common remedy for soil containing low levels of COC. Retained for further evaluation.
		Thermal desorption	Treatment at a permitted off-site thermal desorption facility	Common remedy for soil containing COC. Retained for further evaluation.
		Incineration	Treatment at a permitted off-site incinerator.	Would be potentially feasible for hazardous waste. Evaluation indicates no hazardous waste will be generated during remediation. Not retained for further evaluation.
		Chemical treatment	Treatment at a permitted off-site chemical treatment facility.	Would be potentially feasible for hazardous waste. Evaluation indicates no hazardous waste will be generated during remediation. Not retained for further evaluation.
	On-site Disposal or Treatment	On-site Landfill	Disposal at an engineered on-site landfill.	Insufficient room to implement on-site. Unlikely to be acceptable to community. Not retained for further evaluation.
		Thermal desorption	Treatment using permitted on-site thermal desorption equipment.	Insufficient room to implement on-site. Unlikely to be acceptable to community. Not retained for further evaluation.
		Incineration	Treatment using permitted on-site incineration equipment.	Insufficient room to implement on-site. Unlikely to be acceptable to community. Not retained for further evaluation.

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Table 4-3
Initial Technology Screening for Sediment
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Screening Evaluation
No Action	No Action	No Action	No additional remedial action.	Consideration of a No Action alternative is required by DER-10. Retained for further evaluation.
Institutional Controls	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. An easement can also be used to implement a site management plan which describes work procedures required to manage any remaining site impacts.	Not effective in preventing potential exposures of trespassers or benthic organisms to COC in sediment. Not retained for further evaluation.
Monitoring	Natural Recovery	Monitored Natural Recovery (MNR)	This technology uses the action of naturally occurring processes including sedimentation, erosion, groundwater flux, diffusion, and biological degradation to limit human and environmental exposures to contaminants in sediment. A sediment monitoring program is required to verify that the technology is effective.	Potentially feasible. Retained for further evaluation.
Treatment	In Situ Treatment	Solidification/ Stabilization	Cement or other material is mixed with sediment to harden it or to fix inorganic chemicals.	Innovative technology. Effectiveness and implementability have not been established for sediment. Not retained for further evaluation.
		Bioremediation	Nutrients and a source of oxygen are added to sediment to stimulate degradation by aerobic or anaerobic microorganisms.	Innovative technology. Effectiveness and implementability have not been established for sediment. Not retained for further evaluation.
		Chemical Treatment	Chemicals are added to sediment to treat organic or inorganic contaminants.	Innovative technology. Effectiveness and implementability have not been established for sediment. Not retained for further evaluation.
Removal	Dredging/Excavation	Dredging/ Excavation	Removal of contaminated sediment using dredging or excavation equipment. Excavation requires dewatering of Keuka Lake Outlet.	Commonly used technology for removal of sediment. Retained for further evaluation.
Containment	Subaqueous Cap	Sand cap	Placement of sand on the bed of the Keuka Lake Outlet.	Potentially feasible. Retained for further evaluation.
		Thin cap	Placement of a thin layer of sand or other material on the bottom of the Keuka Lake Outlet.	Innovative technology. Effectiveness and implementability have not been established. Not retained for further evaluation.
		Active Cap	Placement of a layer of engineered low permeability materials(such as bentonite coated aggregate) on the bottom of Keuka Lake Outlet.	Potentially feasible. Effective for preventing the migration of COC in sediment porewater and NAPL. Retained for further evaluation.
		Treatment cap	Placement of subaqueous cap which incorporates processes such as carbon absorption or biological or chemical treatment.	Innovative technology. Effectiveness and implementability have not been established. Not retained for further evaluation.
Waste Management	Off-site Disposal or Treatment	Landfill	Disposal at a permitted off-site landfill	Common remedy for sediment containing low levels of COC. Retained for further evaluation.
		Thermal desorption	Treatment at a permitted off-site thermal desorption facility	Common remedy for sediment containing COC. Retained for further evaluation.
		Incineration	Treatment at a permitted off-site incinerator	Would be potentially feasible for hazardous waste. Evaluation indicates no hazardous waste will be generated during remediation. Not retained for further evaluation
		Chemical treatment	Treatment at a permitted off-site chemical treatment facility	Would be potentially feasible for hazardous waste. Evaluation indicates no hazardous waste will be generated during remediation. Not retained for further evaluation

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Table 4-4
Remedial Technology Evaluation for Groundwater
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
No Action	No Action	No Action	Technology would not include any remedial action. A No Action alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives. Consideration of a No Action alternative is required by DER-10.	Would not achieve the RAOs for groundwater in an acceptable time frame.	Implementable.	Low.	Yes
Institutional Controls	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. The easement could include a site management plan which describes work procedures required to manage any remaining site impacts.	Preventing future use of groundwater for potable or other uses will meet the RAO for prevention of exposure to or inhalation of COC in of contaminated site groundwater. Implementation of an SMP is effective in meeting the RAO for limiting direct contact exposures to or inhalation of contaminants in groundwater.	An on-site environmental easement is readily implementable.	Low	Yes
		Local Ordinance	A local ordinance can be passed that prevents installation of new wells for potable or other use.	Preventing future use of groundwater for potable or other uses will meet the RAO for prevention exposure to or ingestion of COC in site groundwater.	Potentially feasible. No ordinance is currently in place. Will require approval by the municipality.	Low	No
In-Situ Treatment	Natural Attenuation	Monitored Natural Attenuation (MNA)	This technology uses the action of naturally occurring processes including diffusion, dispersion, retardation, partitioning, groundwater flux, and biological degradation to reduce the concentrations of contaminants in groundwater. A groundwater monitoring program is required to verify that the technology is effective.	This technology can be effective in meeting RAOs for prevention of exposures to organic contaminants in groundwater. It is not effective in treating high concentrations of contaminants associated with source areas. For that reason, source removal or control is considered a prerequisite for MNA to be effective.	This technology is implementable. It would require monitoring to demonstrate reduction of contaminants.	Low capital costs. Moderate O&M costs	Yes
	Immobilization	In-Situ Solidification (ISS)	Soil is solidified by mixing with cement or other admixture material using a large soil auger or excavation equipment.	Solidifying soil containing COC limits contact between groundwater and contaminated soil. It can be effective in meeting RAOs for controlling the source of groundwater contamination and preventing migration. It is not effective in meeting the RAO for prevention of direct contact.	This technology is implementatable.	High	No
	Biological Treatment	In-situ Bioremedition	In-situ bioremediation is implemented by adding an oxygen source and nutrients to soil above or below the groundwater elevation in order to stimulate naturally occuring microbial action.	In-situ bioremediation may be effective in treating organic constituents, including PAHs, when concentrations of COC are low or moderate. Is not effective in treating areas with NAPL, staining, sheens, or high concentrations of COC, NAPL. Is not very effective against high-molecular weight compounds.	Implementation of in-situ bioremediation is accomplished using drill rigs, injection wells, and other common equipment. This technology is implementatble.	Moderate	No
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	In-situ chemical oxidation involves the injection of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate, or potassium permanganate into the subsurface using injection wells or wellpoints. The chemical oxidants react with contaminants to reduce mass.	ISCO is potentially effective for use with moderate concentrations of COC in soil or groundwater. It may be necessary to perform multiple injections. It may be more effective in areas with lower concentrations of contaminants and may be useful in areas where access is difficult because of existing structures.	This technology is generally considered implementable for sites with relatively high permeability soils, such as the site. Injection in the contaminated areas close to the Keuka Lake Outlet is not feasible due to the need to prevent the ISCO chemicals from migrating into the outlet.	High	No
	Thermal Treatment	Thermal	Soil above and below the water table elevation are heated to thermally treat contaminants in soil using steam, electrical resistance, or electrical conduction. Steam injection wells or electrodes are used to provide the source of heat. A SVE system is used in conjunction with heating to collect any vapors generated.	In situ thermal treatment using steam injection or electrical resistance heating do not raise soil and groundwater temperatures high enough to treat high concentrations of contaminants or NAPL. Electrical conductance heating can raise temperatures high enough under appropriate circumstances.	This technology is generally considered implementable. Generally, this technology works best for low permeability soils. For that reason, effective implementation is likely to be difficult. Implementation of this technology near the Keuka Lake Outlet is not feasible.	High	No

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Table 4-4
Remedial Technology Evaluation for Groundwater
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
Removal	Excavation	Excavation	Removal of NAPL and soil containing COC using a tracked or wheeled hydraulic excavator or other excavation equipment. For deeper excavations, it is likely that shoring and dewatering operations will be required as part of excavation.	Removal of subsurface soil will meet the RAOs for removal of the source of groundwater contamination and prevention of migration of NAPL.	Excavation is generally considered implementable. Dewatering will be required for complete excavation of impacted materials.	Moderate	Yes
Treatment	Water Treatment	Organic Treatment	Treatment of organic compounds in groundwater extracted during remedial activities may be required for a number of potential technologies. Specific treatment processes to be considered during design may include air stripping, oil/water separation, carbon adsorption, or biological treatment.	This technology process would be effective at meeting the RAOs for prevention of exposure to contaminants in groundwater. Process would potentially be used as part of a treatment train to treat groundwater removed from excavation areas. Has potential to be used as part of a treatment system to meet the RAOs.	This technology is implementable.	Moderate capital and moderate to high O&M costs.	Yes
		Inorganic Treatment	Treatment of inorganic chemicals in groundwater extracted during remedial activities may be required for a number of potential technologies. Specific treatment processes which may be incorporated into the treatment system include precipitation, filtration, ion exchange, sequestration, or peroxide addition.	This technology process would be effective at meeting the RAO for prevention of exposure to contaminants in groundwater. Process would potentially be used as part of a treatment train to treat groundwater removed from excavation areas. Has potential to be used as part of a treatment system to meet the RAOs.	This technology is implementable.	Moderate capital and moderate to high O&M costs.	Yes
Discharge	Groundwater Discharge	Discharge to a local Publicly-Owned Treatment Works (POTW)	Treated or untreated water is discharged to a sanitary sewer and treated at a local POTW facility.	Proven process for effectively disposing of groundwater. Typically requires the least amount of pretreatment because the discharged water will be subjected to additional treatment at the POTW. Could be used as a component of an overall remedy to meet the RAOs for groundwater.	This technology is implementable. Sanitary sewer service is available in the area around the site. It will be necessary to obtain approval from the Penn Yan Municipal Board.	Low Capital and Moderate O&M costs	Yes
		Discharge to Surface Water via Storm Sewer	Treated water is discharged to surface water, provided that the water quality and quantity meet the allowable discharge requirements for surface waters (NYSDEC SPDES compliance).	This technology process would effectively dispose of groundwater. Impacted groundwater would require treatment to achieve water quality discharge limits. Helps in the management of treated water, but does not directly lend to achieving the RAOs for groundwater.	Discharges to surface water must meet substantive requirements of a SPDES permit. Cleanup objectives and sampling requirements may be restrictive. Considered equivalent to discharge to the POTW and will be consided during design if discharge is required.	Low Capital and Moderate O&M costs	No
Containment	Process Barriers	Biological Containment	Containment is provided by installing air sparging wells around areas identified as sources of contamination to groundwater. Contaminants in groundwater are treated by in situ bioremediation. This technology treats contaminated water before it migrates off-site.	Potentially effective to meet the RAO for prevention of off-site migration of COC in groundwater. Not effective to meet the RAO for restoring the groundwater aquifer, removing the source of groundwater impact, or prevention of direct contact.	This technology is implementable.	Moderate capital and O&M costs	No
		Permeable Reactive Barrier	Treatment chemical or carbon is mixed with soil in order to prevent migration of COC in groundwater.	Potentially effective to meet the RAO for prevention of off-site migration of COC in groundwater. Not effective to meet the RAO for restoring the groundwater aquifer, removing the source of groundwater impact, or prevention of direct contact.	This technology is implementable.	Moderate capital and O&M costs	No
	Barrier Wall	Sheet Pile Wall	For this technology, a sheet pile wall will be driven to the depth of the low permeability silt layer as a physical barrier to groundwater and NAPL migration. Special piles with sealable joints can be used to reduce permeability if needed.	As long as there is a low permeability soil layer into which it can be driven, a sheet pile wall will provide an effective barrier against migration of contaminated groundwater. Since no mobile NAPL has been identified, it will not be effective for limiting migration.	This technology is generally considered implementable. Implementation of a barrier wall may require use of a low-flow groundwater pump and treat system to remove water that infiltrates into the area within the wall. Long-term O&M of the pump and treat system will be required.	High	No

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Table 4-5
Remedial Technology Evaluation for Surface Soil
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
No Action	No Action	No Action	Technology would not include any remedial action. A No Action alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives. Consideration of a No Action alternative is required by DER-10.	No action will not meet the surface soil RAOs.	No action does not require implementation.	No cost	Yes
Institutional/ Engineering Controls	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. It can also be used to implement a site management plan describes work procedures required to manage any remaining site impacts.which	Restricting future use of the NYSEG property to industrial and off-site areas to commercial will limit future direct contact exposures in order to meet the RAO for surface soil. It will not directly address inhalation exposures. Implementation of an SMP is effective in meeting the RAO to prevent contact with COC in surface soil. It will not completely address inhalation exposures.	An on-site environmental easement is readily implementable.	Low	Yes
	Engineering Controls	Barriers/fencing	Construction of a fence to prevent site access.	Fencing can be an effective technology to meet the RAO for prevention ingestion/direct contact with contaminated surface soils. It will not directly address inhalation exposures.	A fence is readily implementable.	Low Capital and O&M	Yes
Removal	Excavation	Excavation	Removal of soil to a depth of one foot using a tracked or wheeled hydraulic excavator.	Removal of surface soil will meet the RAO for prevention of ingestion/direct contact with and inhalation of COC in surface soils.	Removal of impacted surface soils is readily implementatble. Erosion and sediment control measures would be required to prevent excavation activities from impact the Keuka Lake Outlet.	Moderate	Yes
Containment	Capping	Soil Cover	Placement of a layer of clean soil to prevent contact with surface soil. A soil cover usually also includes placement of topsoil and seeding or placement of a gravel surface layer.	Placement of a one foot soil cover will prevent contact with and inhalation of COC in surface soil by outdoor workers and trespassers.	Placement of a soil cover is easily implementable. In order to maintain surface elevations, it may be necessary to excavate existing surface soil.	Moderate Capital and Low O&M	Yes
		Asphalt Pavement	Placement of asphalt pavement to prevent contact with surface soil.	Placement of asphalt will prevent contact with or inhalation of COC in surface soil by outdoor workers and trespassers.	Placement of asphalt pavement is implementable. Considered equivalent to a soil cover. Will not be evaluated further, but may be considered during design if a capping alternative is selected.	Moderate Capital and Low O&M	No
Waste Management	Off-site disposal or treatment	Landfill disposal	Soil removed from the site is transported to a permitted off-site landfill for disposal.	Once surface soil has been removed from its original location, landfill disposal is effective in preventing human contact with contaminants and will meet the surface soil RAO.	This technology is implementable. Non-hazardous waste landfills can accept MGP waste materials which have low concentrations of COC. Facilities with sufficient capacity are available.	Moderate	Yes
		Thermal Desorption	Soil removed from the site is transported to a permitted off-site thermal desorption facility for treatment.	Once surface soil has been removed from its original location, thermal treatment is effective in preventing human contact with contaminants and will meet the surface soil RAOs.	This technology is implementable. NYSDEC policy (DER-4) requires management of MGP wastes which do not meet regulatory limits for the toxicity characteristic at a permitted thermal treatment facility. Permitted facilities are available in New York.	Moderate	Yes

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Table 4-6
Remedial Technology Evaluation for Subsurface Soil
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
No Action	No Action	No Action	Technology would not include any remedial action. A No Action alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives. Consideration of a No Action alternative is required by DER-10.	No action will not meet the subsurface soil RAOs.	No action does not require implementation.	No cost	Yes
Institutional/ Engineering Controls	Institutional Controls	Environmental Easement	An easement provides a legal agreement between the property owner and NYSDEC to restrict future site use. It can also be used to implement a site management plan which describes work procedures required to manage any remaining site impacts.	Restricting future use of the NYSEG property to industrial and off-site areas to commercial will limit future exposures in order to prevent human exposure to or inhalation of COC in subsurface soil. Implementation of an SMP is effective in preventing ingestion/ direct contact with or inhalation of COC in subsurface soil.	An on-site environmental easement is readily implementable.	Low	Yes
Removal	Excavation	Excavation	Removal of soil using a tracked or wheeled hydraulic excavator or other excavation equipment. For deeper excavations, it is likely that shoring and dewatering operations will be required as part of excavation.	Removal of subsurface soil will meet the RAOs for prevention of ingestion/direct contact with or inhalation of COC in subsurface soils and removal of the source of groundwater contamination, and prevention of migration of contaminants in soil.	Excavation of subsurface soils is readily implementable. Excavation along the shoreline near the tank pit for Tar Tank B may require coffer-dams in Keuka Lake Outlet.	Moderate	Yes
In-Situ Treatment	Immobilization	In-Situ Solidification (ISS)	Soil is solidified by mixing with cement or other admixture material using a large soil auger or excavation equipment.	Solidifying soil does not change the concentration of COC and does not reduce exposures. It will not be effective in meeting the RAO for prevention of exposure of construction workers to or inhalation of COC in soil.	This technology is implementatable.	Moderate	No
	Biological Treatment	In-situ Bioremedition	In-situ bioremediation is implemented by adding an oxygen source and nutrients to soil above or below the groundwater elevation in order to stimulate naturally occuring microbial action.	In-situ bioremediation may be effective in treating organic constituents, including PAHs, when concentrations of COC are low or moderate. Is not effective in treating areas with NAPL, staining, sheens, or high concentrations of COC, NAPL. Is not very effective against high-molecular weight compounds.	Implementation of in-situ bioremediation is accomplished using drill rigs, injection wells, and other common equipment. This technology is implementatble.	Moderate	No
	Chemical Treatment	In-Situ Chemical Oxidation (ISCO)	In-situ chemical oxidation involves the injection of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate, or potassium permanganate into the subsurface using injection wells or wellpoints. The chemical oxidants react with contaminants to reduce mass.	ISCO is potentially effective for use with moderate concentrations of COC in soil or groundwater. It may be necessary to perform multiple injections.	This technology is generally considered implementable for sites with relatively high permeability soils, such as the site. Injection in the contaminated areas close to the Keuka Lake Outlet is not feasible due to the need to prevent the ISCO chemicals from migrating into the outlet.	High	No
	Thermal Treatment	Thermal	Soil above and below the water table elevation are heated to thermally treat contaminants in soil using steam, electrical resistance, or electrical conduction. Steam injection wells or electrodes are used to provide the source of heat. A SVE system is used in conjunction with heating to collect any vapors generated.	In situ thermal treatment using steam injection or electrical resistance heating do not raise soil and groundwater temperatures high enough to treat high concentrations of contaminants or NAPL. Electrical conductance heating can raise temperatures high enough under appropriate circumstances.	This technology is generally considered implementable. Generally, this technology works best for low permeability soils. For that reason, effective implementation is likely to be difficult. Interference by subsurface structures will also make implementation difficult.	Very high	No

Table 4-6
Remedial Technology Evaluation for Subsurface Soil
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
Waste Management	Off-site disposal or treatment	Landfill disposal	Soil removed from the site is transported to a permitted off-site landfill for disposal.	Once subsurface soil has been removed from its original location, landfill disposal is effective in preventing human contact with contaminants.	This technology is implementable. Non-hazardous waste landfills can accept MGP waste materials which have low concentrations of COC. Facilities with sufficient capacity are available.	Moderate	Yes
		Thermal Desorption	Soil removed from the site is transported to a permitted off-site thermal desorption facility for treatment.	Once subsurface soil has been removed from its original location, thermal treatment is effective in preventing human contact with contaminants and will meet the subsurface soil RAOs.	This technology is implementable. NYSDEC policy (DER-4) requires management of MGP wastes which do not meet regulatory limits for the toxicity characteristic at a permitted thermal treatment facility. Permitted facilities are available in New York.	Moderate	Yes

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Table 4-7
Remedial Technology Evaluation for Sediment
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained?
No Action	No Action	No Action	Technology would not include any remedial action. A No Action alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives. Consideration of a No Action alternative is required by DER-10.	No action will not meet the sediment RAO.	No action does not require implementation.	No cost	Yes
Monitoring	Natural Recovery	Monitored Natural Recovery (MNR)	This technology uses the action of naturally occurring processes including sedimentation, erosion, groundwater flux, diffusion, and biological degradation to limit human and environmental exposures to contaminants in sediment.	This technology may be effective in meeting requirements for prevention of direct contact by human and environmental receptors with COC for areas with lower concentrations. It will probably not be effective for areas with higher concentrations of COC. Removal of sediment with high concentrations of COC may be necessary.	This technology is implementable.	Low Capital and O&M	Yes
Removal	Dredging/ Excavation	Dredging/ Excavation	Removal of contaminated sediment using excavation or dredging equipment. Excavation may require dewatering local portions of the Keuka Lake Outlet using coffer-dams to isolate work areas.	Effective in meeting the RAO for prevention of ingestion/direct contact with contaminated sediment.	Removal of sediment is implementable. Work will require approval from property owner, NYSCC, and easement holder, *Keuka Lake Outlet Compact (KLOC)* .	Moderate	Yes
Containment	Capping	Subaqueous Cap	Construction of soil or active cap to prevent contact with sediment by potential human receptors.	Effective in meeting the RAO for prevention of ingestion/direct contact by human or environmental receptors with contaminated sediment.	Subaqueous capping is implementable. Work will require approval from property owner, NYSCC, and easement holder, KLOC. In order to maintain the bottom elevation of Keuka Lake Outlet, it will be necessary to dredge or excavate sediment.	Moderate Capital and Low O&M	Yes
Waste Management	Off-site Disposal or Treatment	Landfill Disposal	Soil removed from the site is transported to a permitted off-site landfill for disposal.	Once sediment has been removed from its original location, landfill disposal is effective in preventing human or environmental contact with contaminants.	This technology is implementable. Non-hazardous waste landfills can accept MGP waste materials which have low concentrations of COC. Facilities with sufficient capacity are available.	Moderate	Yes
		Thermal Desorption	Soil removed from the site is transported to a permitted off-site thermal desorption facility for treatment.	Once surface soil has been removed from its original location, thermal treatment is effective in preventing human or environmental contact with contaminants.	This technology is implementable. NYSDEC policy (DER-4) requires management of MGP wastes which do not meet regulatory limits for toxicity at a permitted thermal treatment facility. Permitted facilities are available in New York. Treatment of sediment at a thermal facility may require sediment dewatering.	Moderate	Yes

Table 5-1
Remedial Action Objective Summary
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Medium	RAO	Remedial Alternative							
		Alternative U-1 No Action	**Alternative U-2**	**Alternative U-3**	**Alternative U-4**	**Alternative S-1 No Action**	**Alternative S-2**	**Alternative S-3**	**Alternative S-4**
Surface Soil	Prevent ingestion/direct contact with contaminated surface soils.	- Not Addressed	- Excavation - Soil Cover	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
	Prevent inhalation of or exposure to contaminants in surface soil	- Not Addressed	- Excavation - Soil Cover	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
Subsurface Soil	Prevent ingestion/direct contact with contaminated subsurface soils	- Not Addressed	- Excavation - Institutional Controls	- Excavation - Institutional Controls	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
	Prevent migration of contaminants that would result in groundwater or surface water contamination.	- Not Addressed	- Not Addressed	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
	Eliminate through removal, treatment and/or containment source areas in soil, to the extent practicable.	- Not Addressed	- Not Addressed	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
Groundwater	Prevent ingestion/direct contact with contaminated groundwater.	- Not Addressed	- Institutional Controls	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
	Prevent contact with or inhalation of volatiles from impacted groundwater	- Not Addressed	- Institutional Controls	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
	Restore the groundwater aquifer to predisposal/ prerelease conditions to the extent practicable.	- Not Addressed	- Not Addressed	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
	Remove and/or treat the source of groundwater contamination to the extent practicable.	- Not Addressed	- Not Addressed	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
	Prevent the discharge of contaminants to surface water	- Not Addressed	- Not Addressed	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
	Prevent potential migration of contaminated groundwater to the extent practicable	- Not Addressed	- Not Addressed	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable
Free Product/NAPL	Remove free product/NAPL identified at the site to the extent practicable.	- Not Addressed	-Partially Addressed	- Excavation	- Excavation	- Not Addressed	- Excavation - MNA	- Excavation - Capping	- Excavation
	Prevent and/or eliminate any free product/NAPL seeps which result in visual sheens on surface water to the extent practicable.	- Not Addressed	- Not Addressed	- Excavation	- Excavation	- Not Addressed	- Excavation - MNA	- Excavation - Capping	- Excavation
	Eliminate through removal, treatment and/or containment the free product/NAPL as source of contamination of environmental media, to the extent practicable.	- Not Addressed	- Not Addressed	- Excavation	- Excavation	- Not Addressed	- Excavation - MNA	- Excavation - Capping	- Excavation

Table 5-1
Remedial Action Objective Summary
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Medium	RAO	Remedial Alternative							
		Alternative U-1 No Action	**Alternative U-2**	**Alternative U-3**	**Alternative U-4**	**Alternative S-1 No Action**	**Alternative S-2**	**Alternative S-3**	**Alternative S-4**
Sediment	Prevent ingestion/direct contact with contaminated sediment	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable	- Not Addressed	- Excavation - MNA	- Excavation - Capping	- Excavation
	Prevent impacts to benthic organisms from exposure to sediments containing site-related contaminants causing toxicity	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable	- Not Addressed	- Excavation - MNA	- Excavation - Capping	- Excavation
	Restore, to the extent practicable, site-impacted sediments to site background conditions	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable	- Not Addressed	- Excavation - MNA	- Excavation - Capping	- Excavation
Soil Vapor	Mitigate impacts to public health resulting form the potential for soil vapor intrusion into future on-site buildings	- Not Addressed	- Institutional Controls	- Excavation	- Excavation	- Not Applicable	- Not Applicable	- Not Applicable	- Not Applicable

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Table 5-2
Alternative U-2 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-2 – Institutional/Engineering Controls, Excavation of Surface Soil, Removal of Subsurface Piping, Soil Cover, and MNA of Groundwater

Prime Contractor Costs								
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*20% Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$58,500*	*$11,700*	*$70,200*	*$70,200*	*42%*
2	*Fencing and E&S Control*	*LF*	*800*	*$14,800*	*$2,960*	*$17,760*	*$22*	*11%*
3	*Odor Contol Foam Consumables*	*MO*	*1*	*$7,120*	*$1,424*	*$8,544*	*$8,544*	*5%*
4	*Excavation and Material Handling*	*CY*	*1,060*	*$11,100*	*$2,220*	*$13,320*	*$13*	*8%*
5	*Backfill and Site Restoration*	*CY*	*1,332*	*$47,059*	*$9,412*	*$56,470*	*$42*	*34%*
				$138,579	*$27,716*	*$166,294*		*100%*
Other Contracts & Purchases								
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*20% Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*1,820*	*$179,930*	*$35,986*	*$215,916*	*$119*	*100%*
				$179,930	*$35,986*	*$215,916*		*100%*
Oversight Costs								
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*20% Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*1*	*$2,800*	*$560*	*$3,360*	*$3,360*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*4*	*$40,000*	*$8,000*	*$48,000*	*$12,000*	*34%*
3	*Personnel*	*Man Hours*	*575*	*$74,483*	*$14,897*	*$89,379*	*$155*	*64%*
				$117,283	*$23,457*	*$140,739*		*100%*
Grand Total						*$522,950*		

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Tabel 5-3
Alternative U-2 Operations, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-2 – Institutional/Engineering Controls, Excavation of Surface Soil, Removal of Subsurface Piping, Soil Cover, and MNA of Groundwater						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Bi-Annual Monitoring & Reporting (Yr. 0 to 2)	yr	2	$35,780.00	$64,690.89	Twice yearly sampling for years 1 and 2. See OM&M Detail Sheet for breakdown.
	Yearly Monitoring & Reporting (Yr. 3 to 8)	yr	5	$12,155.00	$50,604.67	Annual Sampling years 3 through 8. See OM&M Detail Sheet for breakdown.
	Annual Reports (Year 9 to 30)	yr	23	$3,210.00	$22,533.40	Annual Reports years 8 to 30. See OM&M Detail Sheet for breakdown.
	SUB-TOTAL OM&M				**$137,828.97**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$27,565.79**	
	Total OM&M				**$165,394.76**	

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Table 5-4
Alternative U-3 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-3 - Excavation of Surface Soil and Visually Impacted Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater								
Prime Contractor Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$312,800*	*$62,560*	*$375,360*	*$375,360*	*32%*
2	*Fencing and E&S Control*	*LF*	*800*	*$16,200*	*$3,240*	*$19,440*	*$24*	*2%*
3	*Odor Contol Foam Consumables*	*MO*	*1*	*$15,820*	*$3,164*	*$18,984*	*$18,984*	*2%*
4	*Excavation Shoring*	*SF*	*14,800*	*$513,600*	*$102,720*	*$616,320*	*$42*	*52%*
5	*Excavation Dewatering*	*WEEKS*	*2*	*$7,200*	*$1,440*	*$8,640*	*$4,320*	*1%*
6	*Excavation and Material Handling*	*CY*	*3,340*	*$33,400*	*$6,680*	*$40,080*	*$12*	*3%*
7	*Monitoring Well Installation*	*LF*	*30*	*$1,830*	*$366*	*$2,196*	*$73*	*0%*
8	*Backfill and Site Restoration*	*CY*	*3,906*	*$84,604*	*$16,921*	*$101,525*	*$26*	*9%*
				$985,454	*$197,091*	*$1,182,545*		*100%*
Other Contracts & Purchases					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*5,550*	*$505,560*	*$101,112*	*$606,672*	*$109*	*100%*
				$505,560	*$101,112*	*$606,672*		*100%*
Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*2*	*$5,600*	*$1,120*	*$6,720*	*$3,360*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*8*	*$80,000*	*$16,000*	*$96,000*	*$12,000*	*27%*
3	*Personnel*	*Man Hours*	*1,150*	*$209,795*	*$41,959*	*$251,754*	*$219*	*71%*
				$295,395	*$59,079*	*$354,474*		*100%*
Grand Total						*$2,143,691*		

AECOM

Table 5-5
Alternative U-3 Operations, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-3 - Excavation of Surface Soil and Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Bi-Annual Monitoring & Reporting (Yr. 0 to 2)	yr	2	$35,780.00	$64,690.89	Twice yearly sampling for years 1 and 2. See OM&M Detail Sheet for breakdown.
	Yearly Monitoring & Reporting (Yr. 3 to 8)	yr.	5	$12,155.00	$50,604.67	Annual Sampling years 3 through 8. See OM&M Detail Sheet for breakdown.
	Annual Reports (Year 9 to 30)	yr	23	$3,210.00	$22,533.40	Annual Reports years 8 to 30. See OM&M Detail Sheet for breakdown.
	SUB-TOTAL OM&M				**$137,828.97**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$27,565.79**	
	Total OM&M				**$165,394.76**	

AECOM

Table 5-6
Alternative U-4 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-4 – Excavation of Surface Soil and Subsurface Soil Which Exceeds Unrestricted Use SCOs, Removal of Subsurface Piping, and MNA of Groundwater							
Prime Contractor Costs				20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$317,800*	*$63,560*	*$381,360*	*$381,360*	*26%*
2	*Fencing and E&S Control*	*LF*	*800*	*$16,200*	*$3,240*	*$19,440*	*$24*	*1%*
3	*Odor Contol Foam Consumables*	*MO*	*1*	*$23,060*	*$4,612*	*$27,672*	*$27,672*	*2%*
4	*Excavation Shoring*	*SF*	*19,440*	*$662,080*	*$132,416*	*$794,496*	*$41*	*54%*
5	*Excavation Dewatering*	*WEEKS*	*4*	*$14,400*	*$2,880*	*$17,280*	*$4,320*	*1%*
6	*Excavation and Material Handling*	*CY*	*5,340*	*$63,400*	*$12,680*	*$76,080*	*$14*	*5%*
7	*Backfill and Site Restoration*	*CY*	*6,408*	*$128,836*	*$25,767*	*$154,603*	*$24*	*11%*
				$1,225,776	*$245,155*	*$1,470,931*		*100%*
Other Contracts & Purchases					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*8,860*	*$805,840*	*$161,168*	*$967,008*	*$109*	*100%*
				$805,840	*$161,168*	*$967,008*		*100%*
Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*3*	*$7,000*	*$1,400*	*$8,400*	*$3,360*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*10*	*$100,000*	*$20,000*	*$120,000*	*$12,000*	*27%*
3	*Personnel*	*Man Hours*	*1,438*	*$259,168*	*$51,834*	*$311,001*	*$216*	*71%*
				$366,168	*$73,234*	*$439,401*		*100%*
Grand Total						*$2,877,340*		

AECOM

Table 5-7
Alternative U-4 Operations, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-4 – Excavation of Surface Soil and Subsurface Soil Which Exceeds Unrestricted Use SCOs, Removal of Subsurface Piping, and MNA of Groundwater						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Monitoring Well Installation	EA	2	$4,500.00	$9,000.00	Install 2 monitoring wells, following upland remediation
	Monitoring & Reporting	Rounds	1	$16,440.00	$16,440.00	Occurs within 1 year following upland remediation.
	SUB-TOTAL OM&M				**$25,440.00**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$3,288.00**	
	Total OM&M				**$28,728.00**	

AECOM

Table 5-8
Alternative S-2 Capital Cost
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York
Revised March 1, 2012

Alternative S-2 – Excavation/Dredging of Shallow Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR								
Prime Contractor Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$382,800*	*$76,560*	*$459,360*	*$459,360*	*18%*
2	*Site Fencing and Erosion Control*	*LF*	*1,500*	*$27,750*	*$5,550*	*$33,300*	*$22*	*1%*
3	*Odor Control Foam Consumables*	*MO*	*2*	*$23,360*	*$4,672*	*$28,032*	*$14,016*	*1%*
4	*Excavation Shoring*	*SF*	*33,820*	*$1,223,700*	*$244,740*	*$1,468,440*	*$43*	*56%*
5	*Excavation Dewatering*	*Week*	*8*	*$40,000*	*$8,000*	*$48,000*	*$6,000*	*2%*
6	*Excavation & Material Handling*	*CY*	*6,630*	*$302,500*	*$60,500*	*$363,000*	*$55*	*14%*
7	*Backfill and Site Restoration*	*CY*	*6,630*	*$185,970*	*$37,194*	*$223,164*	*$34*	*9%*
				$2,186,080	*$437,216*	*$2,623,296*		*100%*
Other Contracts & Purchases					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*12,034*	*$1,095,049*	*$219,010*	*$1,314,058*	*$109*	*100%*
				$1,095,049	*$219,010*	*$1,314,058*		*100%*
Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*3*	*$9,800*	*$1,960*	*$11,760*	*$3,920*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*12*	*$140,000*	*$28,000*	*$168,000*	*$14,000*	*24%*
3	*Personnel*	*Man Hours*	*1,969*	*$428,403*	*$85,681*	*$514,084*	*$261*	*74%*
				$578,203	*$115,641*	*$693,844*		*100%*
Grand Total						*$4,631,198*		

AECOM

Table 5-9
Alternative S-2 Operations, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative S-2 – Excavation/Dredging of Surface Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Sediment Sampling	Event	3	$32,230.00	$81,251.97	Computed using PV for sampling events occuring at years 1,2,and 5 (3 events total)
	Monitoring & Reporting	Yr.	30	$3,210.00	$39,833.02	Computed using PV for annual reports, year 1 through 30.
	SUB-TOTAL OM&M				**$121,084.99**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$24,217.00**	
	Total OM&M				**$145,301.99**	

AECOM

Table 5-10
Alternative S-3 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative S-3 – Excavation/Dredging of Surface Sediment and Subaqueous Capping							
Prime Contractor Costs				20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$372,800*	*$74,560*	*$447,360*	*$447,360*	*18%*
2	*Site Fencing and Erosion Control*	*LF*	*1,500*	*$27,750*	*$5,550*	*$33,300*	*$22*	*1%*
3	*Odor Control Foam Consumables*	*MO*	*1*	*$14,000*	*$2,800*	*$16,800*	*$16,800*	*1%*
4	*Excavation Shoring*	*SF*	*33,820*	*$1,223,700*	*$244,740*	*$1,468,440*	*$43*	*60%*
5	*Excavation Dewatering*	*Week*	*4*	*$20,000*	*$4,000*	*$24,000*	*$6,000*	*1%*
6	*Excavation & Material Handling*	*CY*	*2,540*	*$116,000*	*$23,200*	*$139,200*	*$55*	*6%*
7	*Backfill, Cap, and Site Restoration*	*CY*	*2,540*	*$257,675*	*$51,535*	*$309,210*	*$122*	*13%*
				$2,031,925	*$406,385*	*$2,438,310*		*100%*
Other Contracts & Purchases					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*4,610*	*$419,510*	*$83,902*	*$503,412*	*$109*	*100%*
				$419,510	*$83,902*	*$503,412*		*100%*
Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*2*	*$5,600*	*$1,120*	*$6,720*	*$3,360*	*1%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*8*	*$80,000*	*$16,000*	*$96,000*	*$12,000*	*19%*
3	*Personnel*	*Man Hours*	*1,125*	*$328,068*	*$65,614*	*$393,681*	*$350*	*79%*
				$413,668	*$82,734*	*$496,401*		*100%*
Grand Total						*$3,438,123*		

AECOM

Table 5-11
Alternative S-3 Operation, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yann, New York

Alternative S-3 – Excavation/Dredging of Surface Sediment and Subaqueous Capping						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Sediment Sampling	Event	3	$32,230.00	$81,251.97	Computed using PV for sampling events occuring at years 1,2,and 5 (3 events total)
	Yearly Cap Inspection (years 1-5)	Event	5	$3,940.00	$16,154.78	
	Monitoring & Reporting	Yr.	30	$3,210.00	$39,833.02	Computed using PV for annual reports, year 1 through 30.
	SUB-TOTAL OM&M				**$137,239.77**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$27,447.95**	
	Total OM&M				**$164,687.72**	

AECOM

Table 5-12
Alternative S-4 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

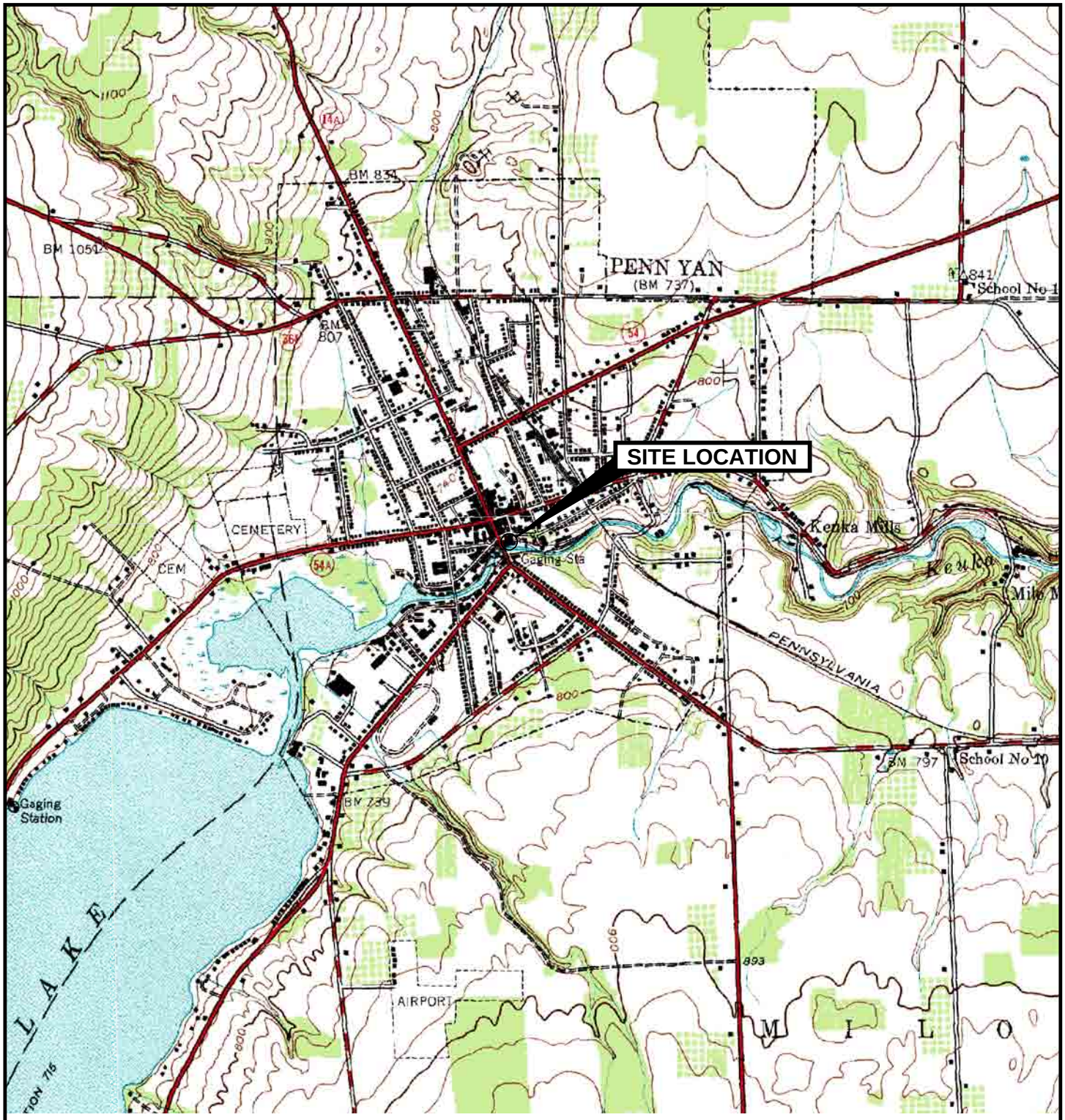
Alternative S-4 – Full Excavation/Dredging of Impacted Sediment and Placement of Backfill

Prime Contractor Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$391,800*	*$78,360*	*$470,160*	*$470,160*	*15%*
2	*Pre-Design Investigation*	*LS*	*1*	*$300,000*	*$60,000*	*$360,000*	*$360,000*	*11%*
3	*Site Fencing and Erosion Control*	*LF*	*1,500*	*$27,750*	*$5,550*	*$33,300*	*$22*	*1%*
4	*Odor Control Foam Consumables*	*MO*	*3*	*$40,560*	*$8,112*	*$48,672*	*$19,469*	*2%*
5	*Excavation Shoring*	*SF*	*33,820*	*$1,218,700*	*$243,740*	*$1,462,440*	*$43*	*46%*
6	*Excavation Dewatering*	*Week*	*8*	*$57,600*	*$11,520*	*$69,120*	*$8,640*	*2%*
7	*Excavation & Material Handling*	*CY*	*7,200*	*$328,500*	*$65,700*	*$394,200*	*$55*	*12%*
8	*Backfill and Site Restoration*	*LS*	*1*	*$276,800*	*$55,360*	*$332,160*	*$332,160*	*10%*
				$2,641,710	*$528,342*	*$3,170,052*		*100%*
Other Contracts & Purchases					**20%**			
Task ID	***Task Descr.***	***Unit***	***Quantity***	***Bare Cost***	***Contingency***	***Total Cost***	***Unit Rate***	***%***
1	*Waste Disposal*	*Ton*	*13,070*	*$1,189,370*	*$237,874*	*$1,427,244*	*$109*	*100%*
				$1,189,370	*$237,874*	*$1,427,244*		*100%*
Oversight Costs					**20%**			
Task ID	***Task Descr.***	***Unit***	***Quantity***	***Bare Cost***	***Contingency***	***Total Cost***	***Unit Rate***	***%***
1	*Temporary Facilities*	*MO*	*4*	*$11,200*	*$2,240*	*$13,440*	*$3,360*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*12*	*$60,000*	*$12,000*	*$72,000*	*$6,000*	*10%*
3	*Personnel*	*Man Hours*	*2,250*	*$513,921*	*$102,784*	*$616,705*	*$274*	*88%*
				$585,121	*$117,024*	*$702,145*		*100%*
Grand Total						*$5,299,441*		

Table 5-13
Comparative Ranking for Remedial Alternatives
Penn Yan Former MGP Site – Penn Yan, New York

		Threshold Criteria		Balancing Criteria						
Alt. Number	**Description**	**Overall Protection of Human Health and the Environment**	**Compliance with SCGs**	**Long-Term Effectiveness and Permanence**	**Reduction of Toxicity, Mobility, & Volume Through Treatment**	**Short-Term Effectiveness**	**Implementability**	**Land Use**	**Total Cost Range (-30 to +50%)**	**Cost Effectiveness**
Upland Alternatives										
U-1	No Action	Not protective	Not Compliant	4	4	1	1	4	No Cost	3
U-2	Institutional Controls, Excavation of Surface Soil, Removal of Subsurface Piping, Soil Cover, and MNA of Groundwater	Protective	Compliant	3	3	2	2	3	$480,000 to $1,035,000	2
U-3	Excavation of Surface Soil and Visually Impacted Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater	Protective	Compliant	2	2	3	3	2	$1,610,000 to $3,460,000	1
U-4	Excavation of Surface Soil and Subsurface Soil Which Exceeds Unrestricted Use SCOs, Removal of Subsurface Piping, and MNA of Groundwater	Protective	Compliant	1	1	4	4	1	$2,035,000 to $4,360,000	2
Sediment Alternatives										
S-1	No Action	Not Protective	Not Compliant	4	4	1	1	2	No Cost	4
S-2	Excavation/Dredging of Shallow Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR	Protective	Compliant	2	2	3	2	1	$3,241,800 to $7,171,800	1
S-3	Excavation/Dredging of Shallow Sediment and Subaqueous Capping	Protective	Compliant	3	3	3	2	1	$2,520,000 to $5,400,000	3
S-4	Full Excavation/Dredging of Impacted Sediment and Placement of Backfill	Protective	Compliant	1	1	4	2	1	$3,710,000 to $7,950,000	2

Figures



UNITED STATES GEOLOGIC SURVEY
PENN YAN QUADRANGLE
NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHY)

PENN YAN, NY.
1983
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SCALE 1:24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

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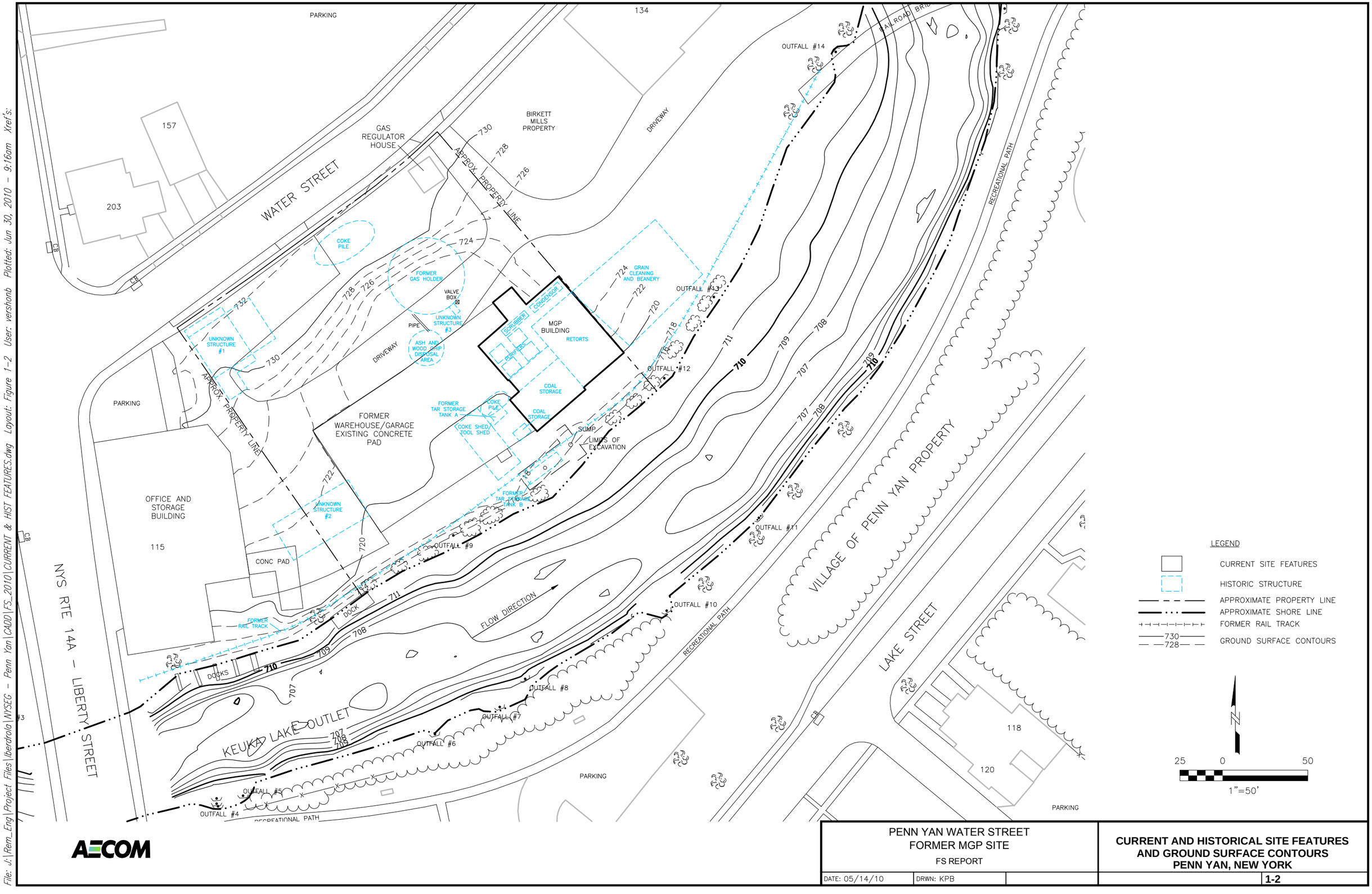
AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			**SITE LOCATION MAP** **PENN YAN , NEW YORK**
DATE: 05/14/10	DRWN: KPB		**FIGURE 1-1**

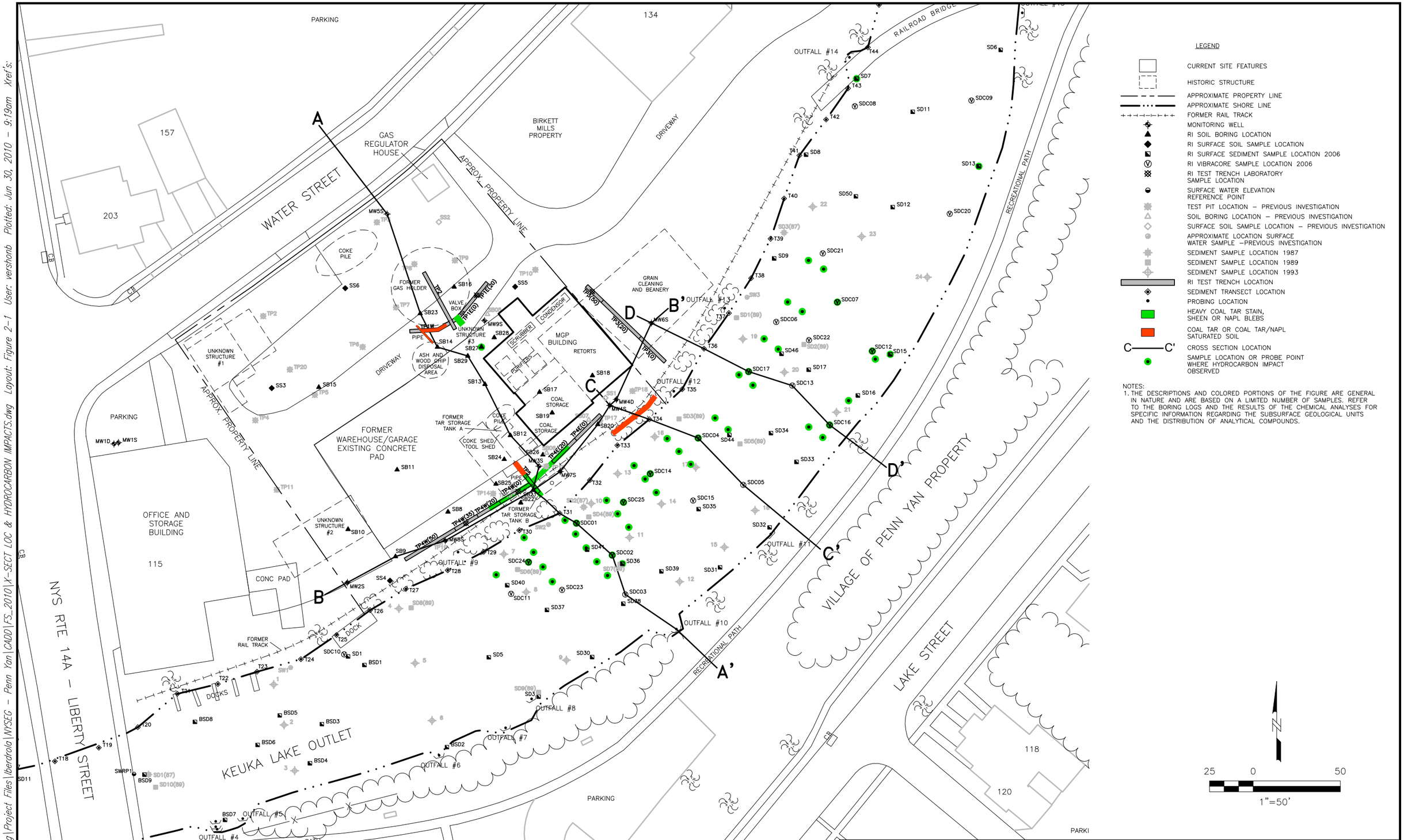
File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG - Penn Yan\CADD\FS_2010\SITE_LOC.dwg Layout: Figure 1-1 User: vershonb Plotted: Jun 30, 2010 - 9:13am Xref's:



AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			CURRENT AND HISTORICAL SITE FEATURES AND GROUND SURFACE CONTOURS PENN YAN, NEW YORK
DATE: 05/14/10	DRWN: KPB		1-2

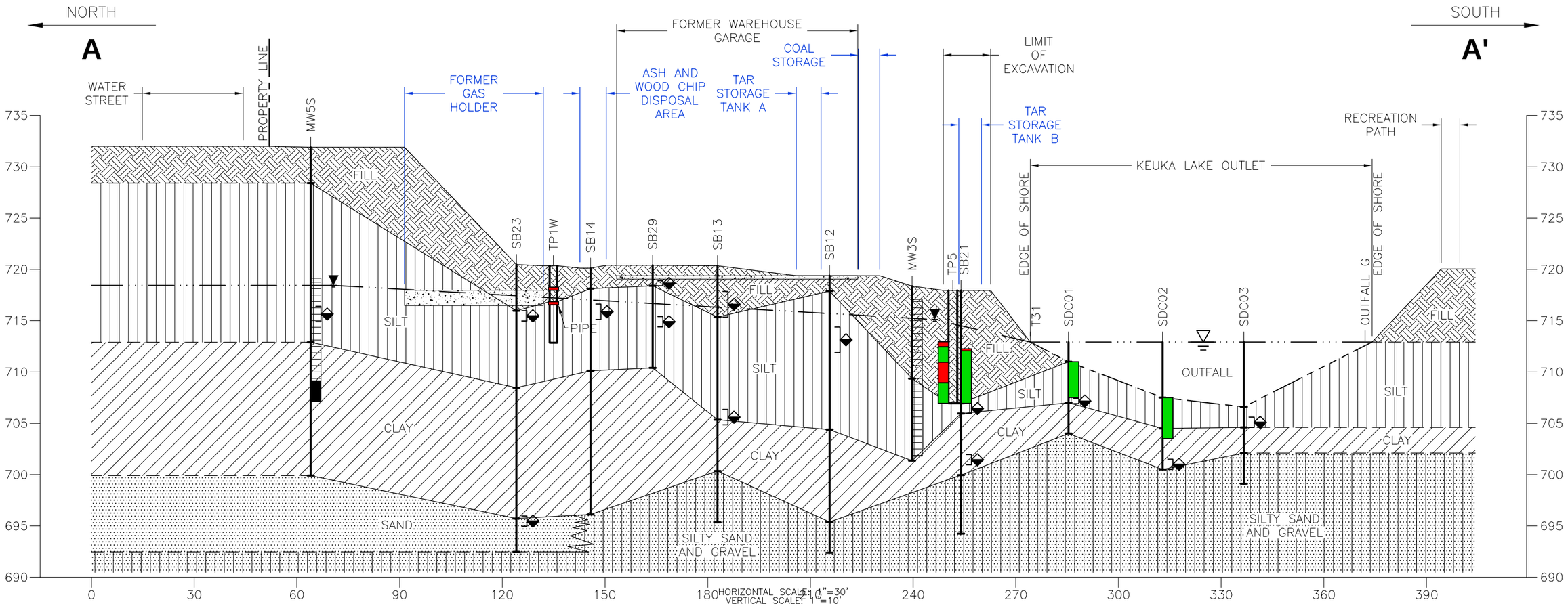
File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG - Penn Yan\CADD\FS_2010\CURRENT & HIST FEATURES.dwg Layout: Figure 1-2 User: vershonb Plotted: Jun 30, 2010 - 9:16am Xref's:



AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			CROSS-SECTION LOCATION MAP AND AREAL EXTENT OF OBSERVED HYDROCARBON IMPACTS PENN YAN, NEW YORK
DATE: 05/14/10	DRWN: KPB		2-1

File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG – Penn Yan\CADD\FS_2010\X-SECT LOC & HYDROCARBON IMPACTS.dwg Layout: Figure 2-1 User: vershonb Plotted: Jun 30, 2010 – 9:19am Xref's:



LEGEND

OBSERVED HYDROCARBON IMPACTS

- HEAVY COAL TAR STAIN, SHEEN OR NAPL BLEBS
- COAL TAR OR COAL TAR/ NAPL SATURATED SOIL
- LABORATORY SAMPLE RANGE
- SUMP

- FILL
- SILT
- CLAY
- SAND
- SILTY SAND AND GRAVEL
- CONCRETE

- MONITORING WELL SCREEN
- SOIL BORING OR VIBRACORE SAMPLE
- FORMER STRUCTURE LOCATION
- DIRECT CONTACT
- INFERRED CONTACT
- SEDIMENT SURFACE
- OUTLET ELEVATION
- GROUNDWATER ELEVATION OCTOBER 25, 2006

NOTES:
1. THE DESCRIPTIONS AND COLORED PORTIONS OF THE FIGURE ARE GENERAL IN NATURE AND ARE BASED ON A LIMITED NUMBER OF SAMPLES. REFER TO THE BORING LOGS AND THE RESULTS OF THE CHEMICAL ANALYSES FOR SPECIFIC INFORMATION REGARDING THE SUBSURFACE GEOLOGICAL UNITS AND THE DISTRIBUTION OF ANALYTICAL COMPOUNDS.
2. SECTION IS POINT TO POINT.

AECOM

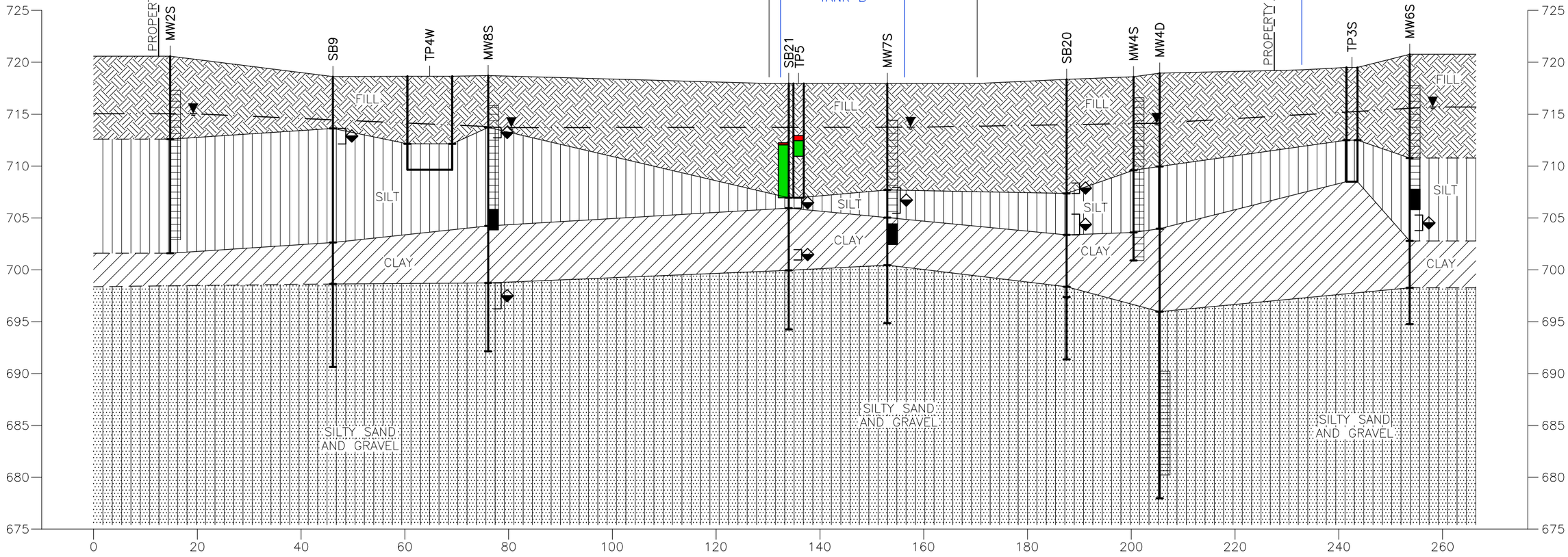
PENN YAN WATER STREET FORMER MGP SITE FS REPORT			**CROSS-SECTION A-A' PENN YAN, NEW YORK**
DATE: 05/14/10	DRWN: KPB		**2-2**

WEST

B

EAST

B'



HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=10'

LEGEND

OBSERVED HYDROCARBON IMPACTS

- HEAVY COAL TAR STAIN, SHEEN OR NAPL BLEBS
- COAL TAR OR COAL TAR/ NAPL SATURATED SOIL
- LABORATORY SAMPLE RANGE
- SUMP

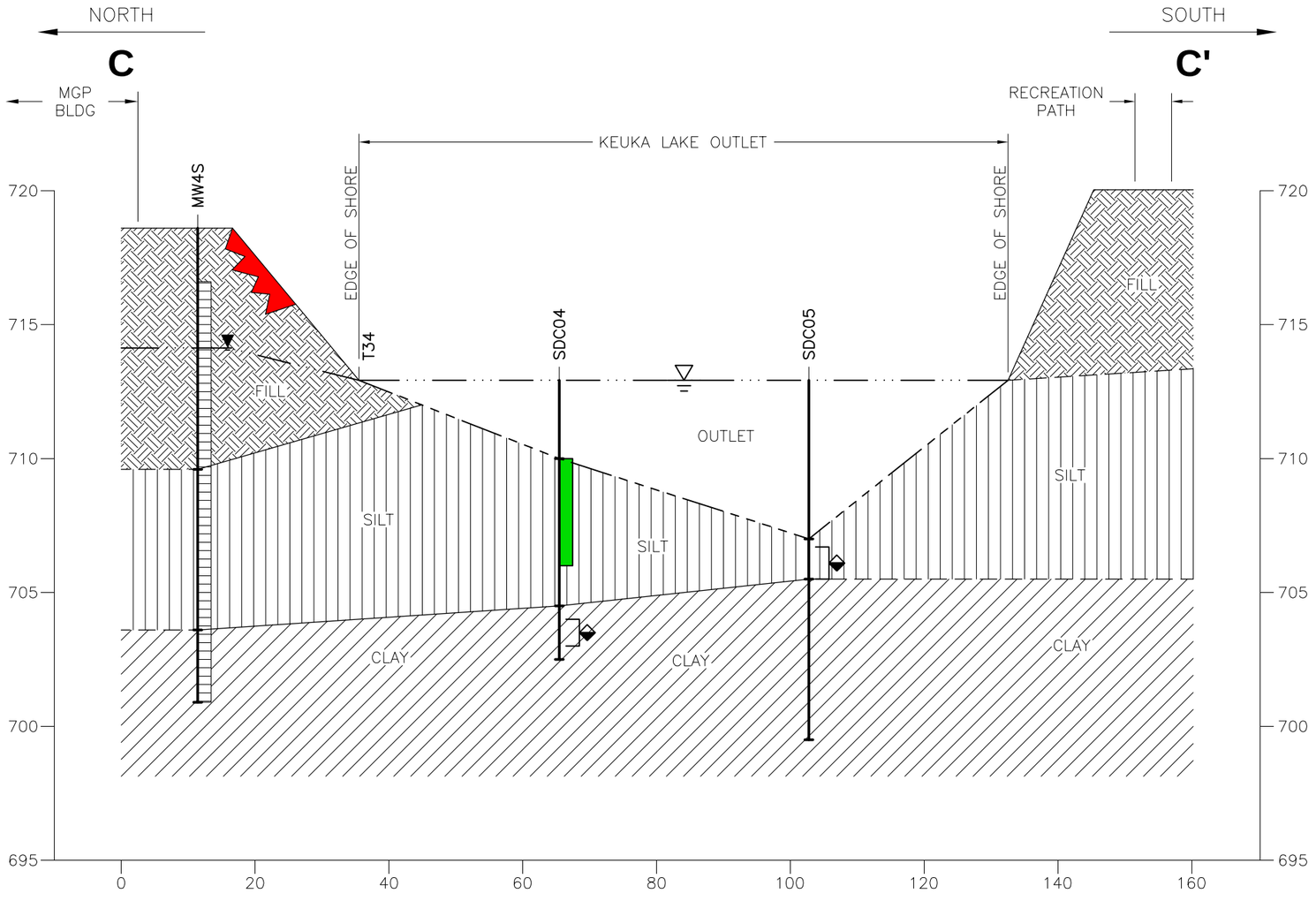
- FILL
- SILT
- CLAY
- SAND
- SILTY SAND AND GRAVEL

- MONITORING WELL SCREEN
- SOIL BORING OR VIBRACORE SAMPLE
- FORMER STRUCTURE LOCATION
- DIRECT CONTACT
- INFERRED CONTACT
- SEDIMENT SURFACE
- OUTLET ELEVATION
- GROUNDWATER ELEVATION OCTOBER 25, 2006

NOTES:
1. THE DESCRIPTIONS AND COLORED PORTIONS OF THE FIGURE ARE GENERAL IN NATURE AND ARE BASED ON A LIMITED NUMBER OF SAMPLES. REFER TO THE BORING LOGS AND THE RESULTS OF THE CHEMICAL ANALYSES FOR SPECIFIC INFORMATION REGARDING THE SUBSURFACE GEOLOGICAL UNITS AND THE DISTRIBUTION OF ANALYTICAL COMPOUNDS.
2. SECTION IS POINT TO POINT.

AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			CROSS-SECTION B-B' PENN YAN, NEW YORK
DATE: 05/14/10	DRWN: KPB		2-3



HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=5'

LEGEND

OBSERVED HYDROCARBON IMPACTS

- HEAVY COAL TAR STAIN, SHEEN OR NAPL BLEBS
- COAL TAR OR COAL TAR/ NAPL SATURATED SOIL
- LABORATORY SAMPLE RANGE
- SUMP

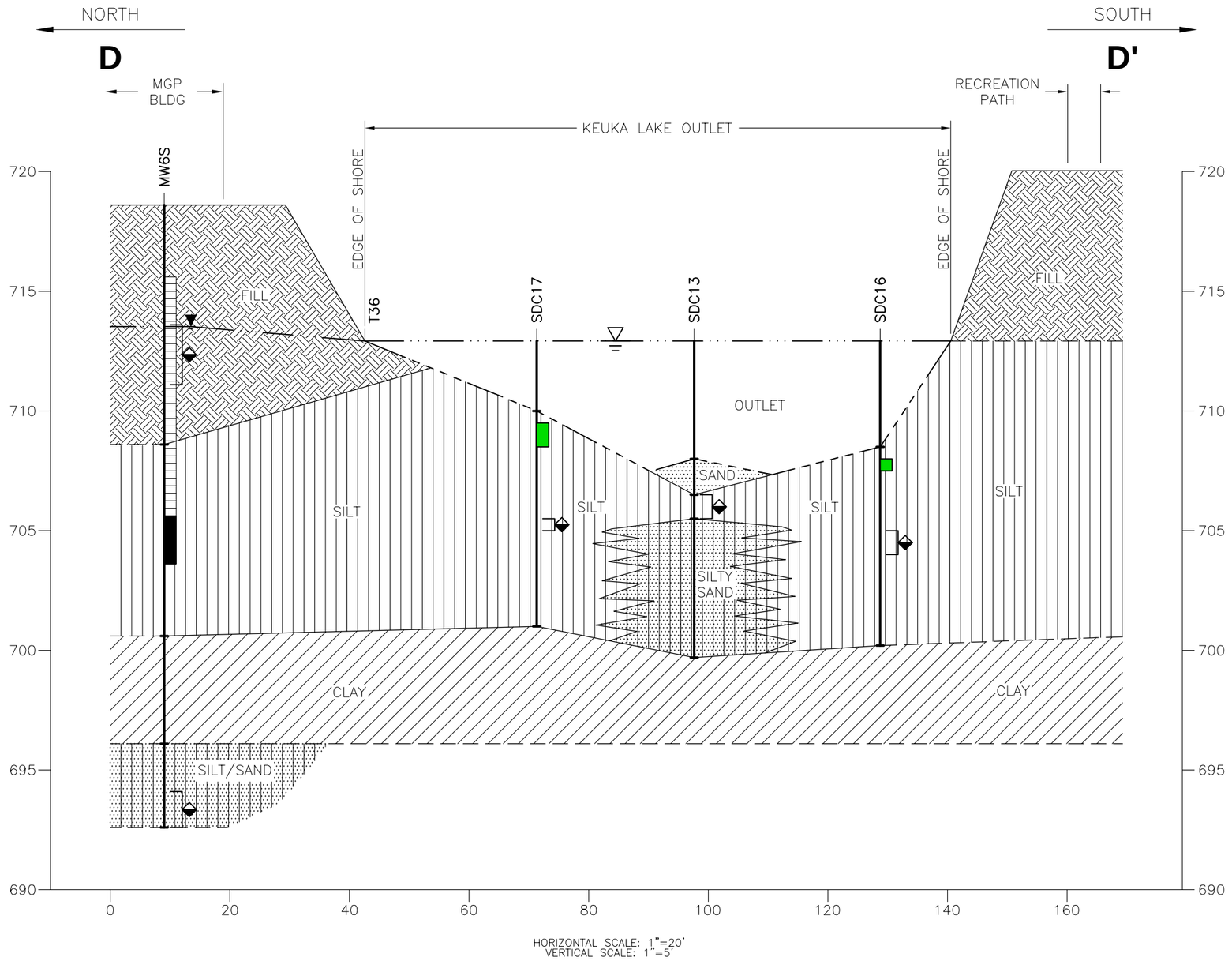
- FILL
- SILT
- CLAY
- SAND
- SILTY SAND AND GRAVEL

- MONITORING WELL SCREEN
- SOIL BORING OR VIBRACORE SAMPLE
- FORMER STRUCTURE LOCATION
- DIRECT CONTACT
- INFERRED CONTACT
- SEDIMENT SURFACE
- OUTLET ELEVATION
- GROUNDWATER ELEVATION OCTOBER 25, 2006

NOTES:
1. THE DESCRIPTIONS AND COLORED PORTIONS OF THE FIGURE ARE GENERAL IN NATURE AND ARE BASED ON A LIMITED NUMBER OF SAMPLES. REFER TO THE BORING LOGS AND THE RESULTS OF THE CHEMICAL ANALYSES FOR SPECIFIC INFORMATION REGARDING THE SUBSURFACE GEOLOGICAL UNITS AND THE DISTRIBUTION OF ANALYTICAL COMPOUNDS.
2. SECTION IS POINT TO POINT.

AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			CROSS-SECTION C-C' PENN YAN, NEW YORK
DATE: 05/14/10	DRWN: KPB		2-4



LEGEND

OBSERVED HYDROCARBON IMPACTS
- HEAVY COAL TAR STAIN, SHEEN OR NAPL BLEBS
- COAL TAR OR COAL TAR/ NAPL SATURATED SOIL
- LABORATORY SAMPLE RANGE
- SUMP

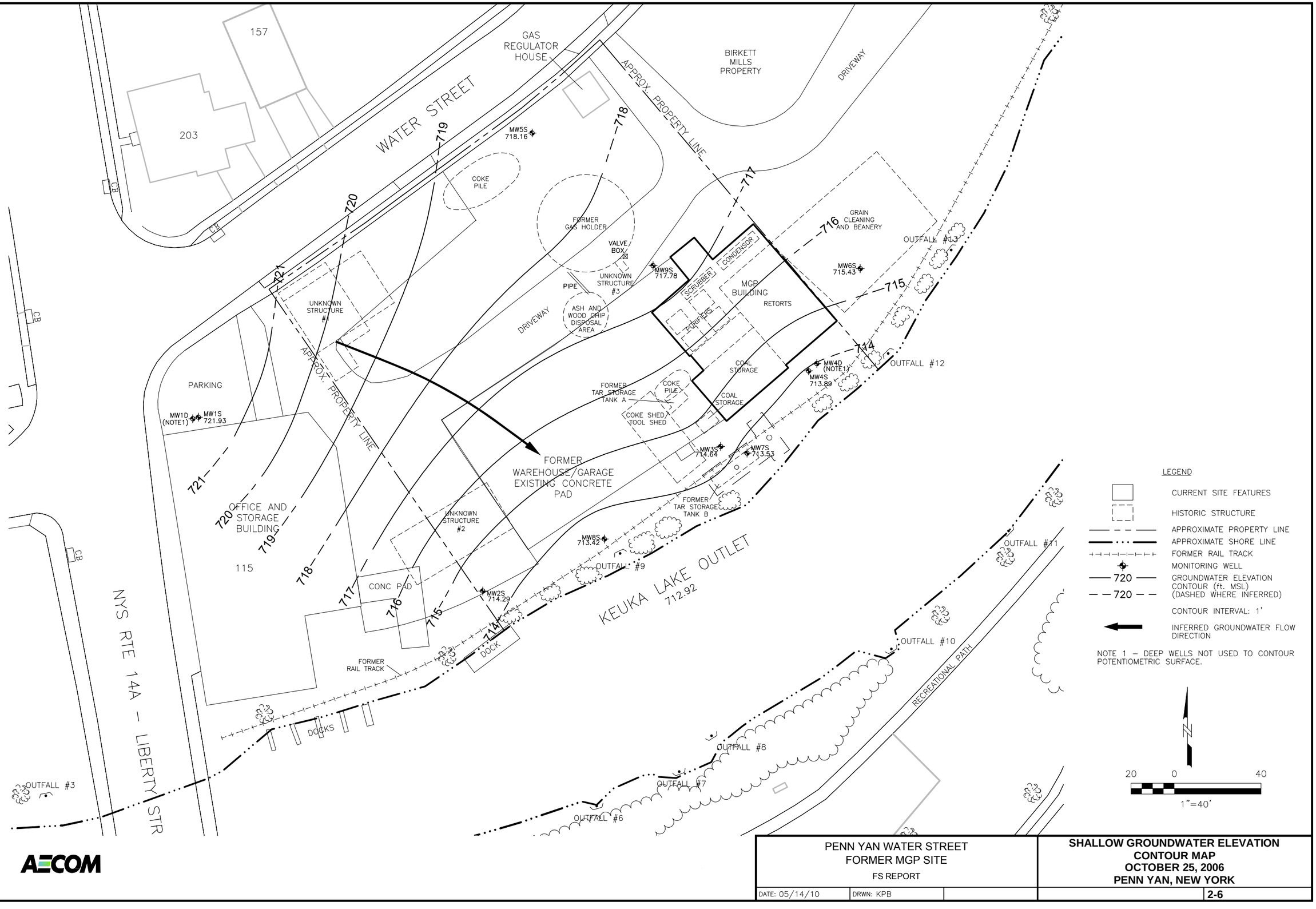
- FILL
- SILT
- CLAY
- SAND
- SILTY SAND AND GRAVEL

- MONITORING WELL SCREEN
- SOIL BORING OR VIBRACORE SAMPLE
- FORMER STRUCTURE LOCATION
- DIRECT CONTACT
- INFERRED CONTACT
- SEDIMENT SURFACE
- OUTLET ELEVATION
- GROUNDWATER ELEVATION OCTOBER 25, 2006

NOTES:
1. THE DESCRIPTIONS AND COLORED PORTIONS OF THE FIGURE ARE GENERAL IN NATURE AND ARE BASED ON A LIMITED NUMBER OF SAMPLES. REFER TO THE BORING LOGS AND THE RESULTS OF THE CHEMICAL ANALYSES FOR SPECIFIC INFORMATION REGARDING THE SUBSURFACE GEOLOGICAL UNITS AND THE DISTRIBUTION OF ANALYTICAL COMPOUNDS.
2. SECTION IS POINT TO POINT.

AECOM

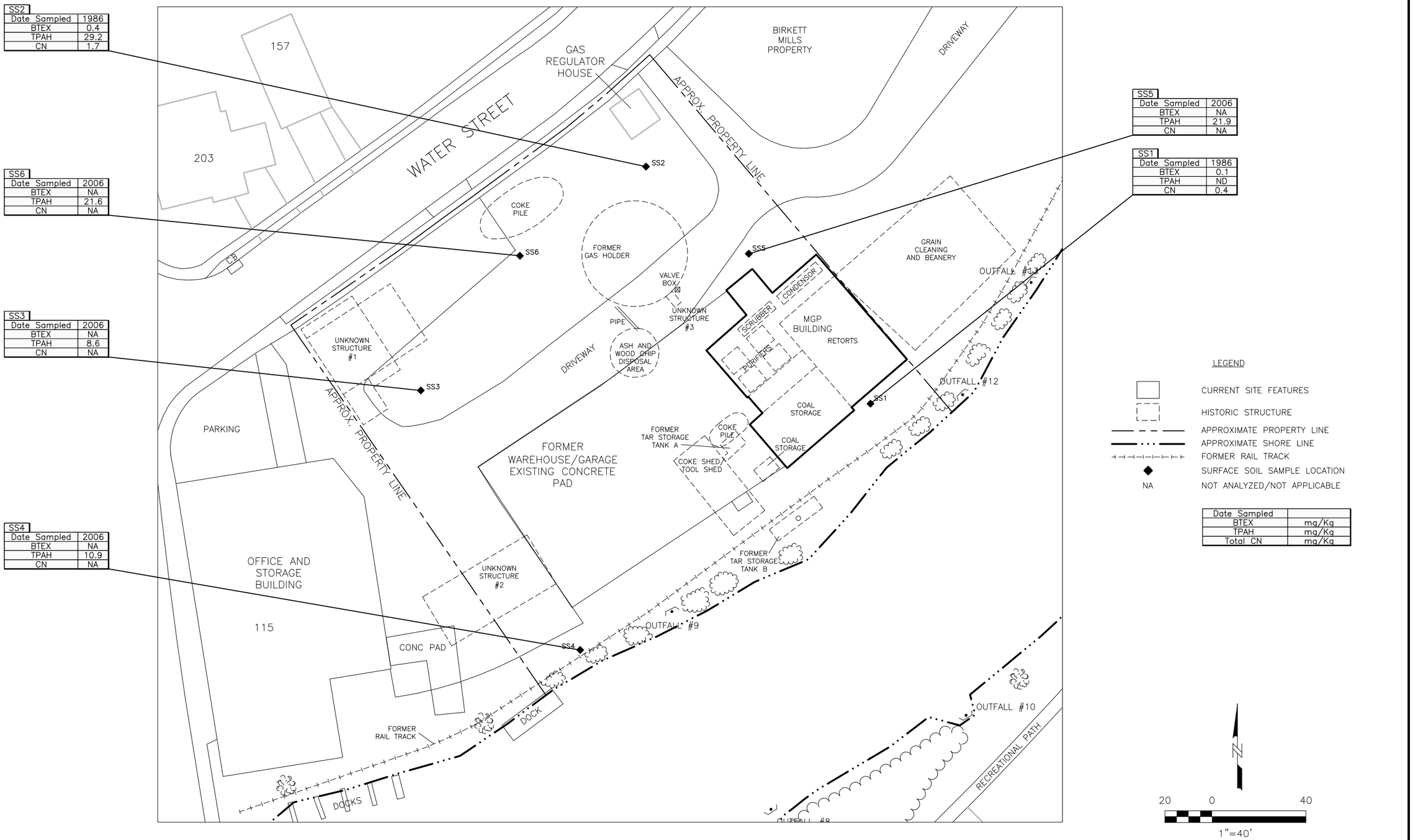
PENN YAN WATER STREET FORMER MGP SITE FS REPORT			CROSS-SECTION D-D' PENN YAN NEW YORK
DATE: 05/14/10	DRWN: KPB		2-5



AECOM

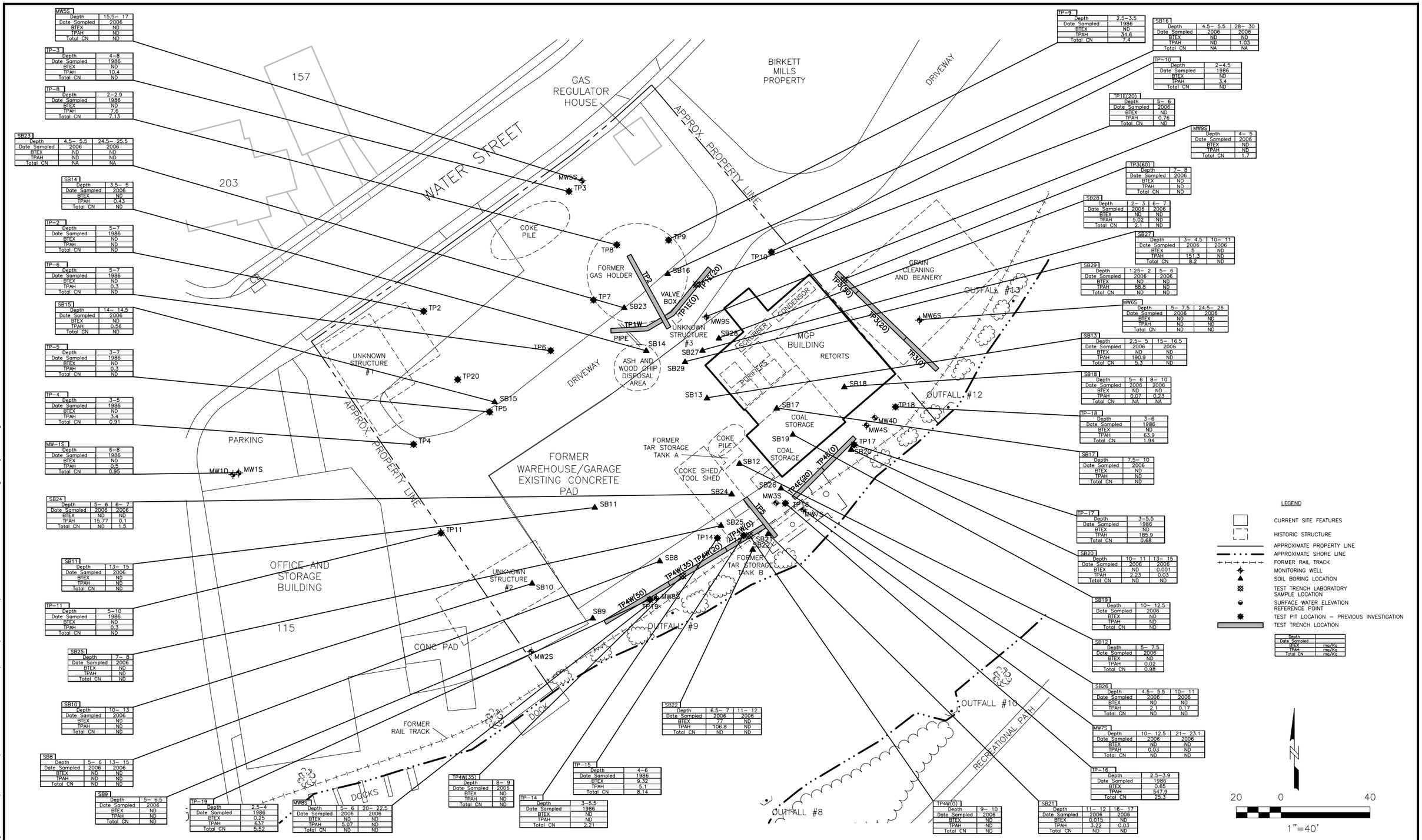
PENN YAN WATER STREET FORMER MGP SITE FS REPORT			**SHALLOW GROUNDWATER ELEVATION CONTOUR MAP OCTOBER 25, 2006 PENN YAN, NEW YORK**
DATE: 05/14/10	DRWN: KPB		**2-6**

File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG – Penn Yan\CADD\FS_2010\SHALLOW GW CONTOUR.dwg Layout: Figure 2-6 User: vershonb Plotted: Jun 30, 2010 – 9:32am Xref's:



AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			SURFACE SOIL SAMPLE RESULTS PENN YAN, NEW YORK
DATE: 05/14/10	DRWN: KPB		2-7



AECOM

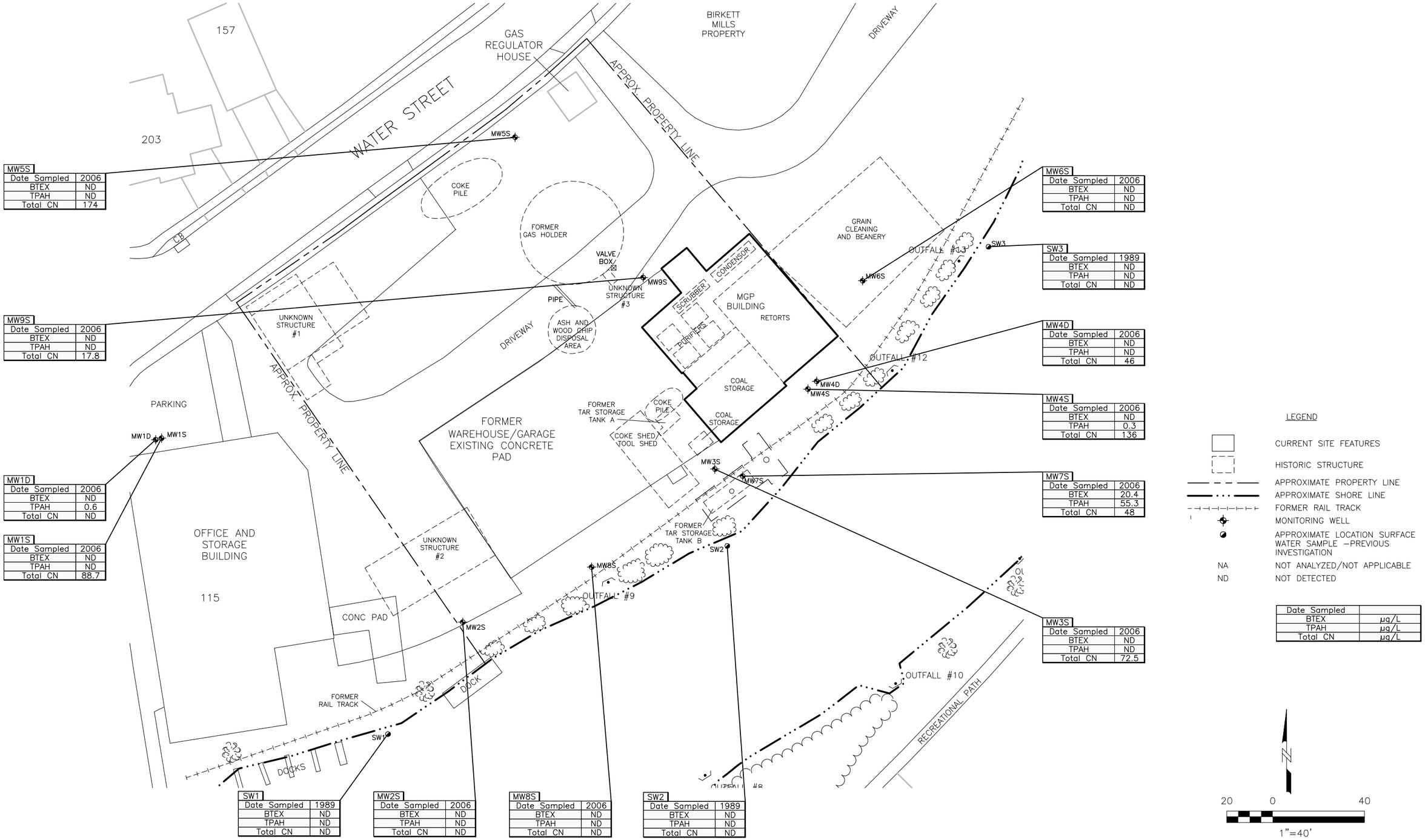
PENN YAN WATER STREET
FORMER MGP SITE
FS REPORT

DATE: 05/14/10 | DRWN: KPB

SUBSURFACE SOIL RESULTS
PENN YAN, NEW YORK

2-8

File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG – Penn Yan\CADD\FS_2010\SUBSURF_SOIL_RESULTS.dwg Layout: Figure 2-8 User: vershonb Plotted: Jun 30, 2010 – 9:36am Xref's:



MW5S	
Date Sampled	2006
BTEX	ND
TPAH	ND
Total CN	174

MW9S	
Date Sampled	2006
BTEX	ND
TPAH	ND
Total CN	17.8

MW1D	
Date Sampled	2006
BTEX	ND
TPAH	0.6
Total CN	ND

MW1S	
Date Sampled	2006
BTEX	ND
TPAH	ND
Total CN	88.7

SW1	
Date Sampled	1989
BTEX	ND
TPAH	ND
Total CN	ND

MW2S	
Date Sampled	2006
BTEX	ND
TPAH	ND
Total CN	ND

MW8S	
Date Sampled	2006
BTEX	ND
TPAH	ND
Total CN	ND

SW2	
Date Sampled	1989
BTEX	ND
TPAH	ND
Total CN	ND

MW6S	
Date Sampled	2006
BTEX	ND
TPAH	ND
Total CN	ND

SW3	
Date Sampled	1989
BTEX	ND
TPAH	ND
Total CN	ND

MW4D	
Date Sampled	2006
BTEX	ND
TPAH	ND
Total CN	46

MW4S	
Date Sampled	2006
BTEX	ND
TPAH	0.3
Total CN	136

MW7S	
Date Sampled	2006
BTEX	20.4
TPAH	55.3
Total CN	48

MW3S	
Date Sampled	2006
BTEX	ND
TPAH	ND
Total CN	72.5

LEGEND

- CURRENT SITE FEATURES
- HISTORIC STRUCTURE
- APPROXIMATE PROPERTY LINE
- APPROXIMATE SHORE LINE
- FORMER RAIL TRACK
- MONITORING WELL
- APPROXIMATE LOCATION SURFACE WATER SAMPLE –PREVIOUS INVESTIGATION

NA NOT ANALYZED/NOT APPLICABLE

ND NOT DETECTED

Date Sampled	
BTEX	µg/L
TPAH	µg/L
Total CN	µg/L

N

20 0 40

1"=40'

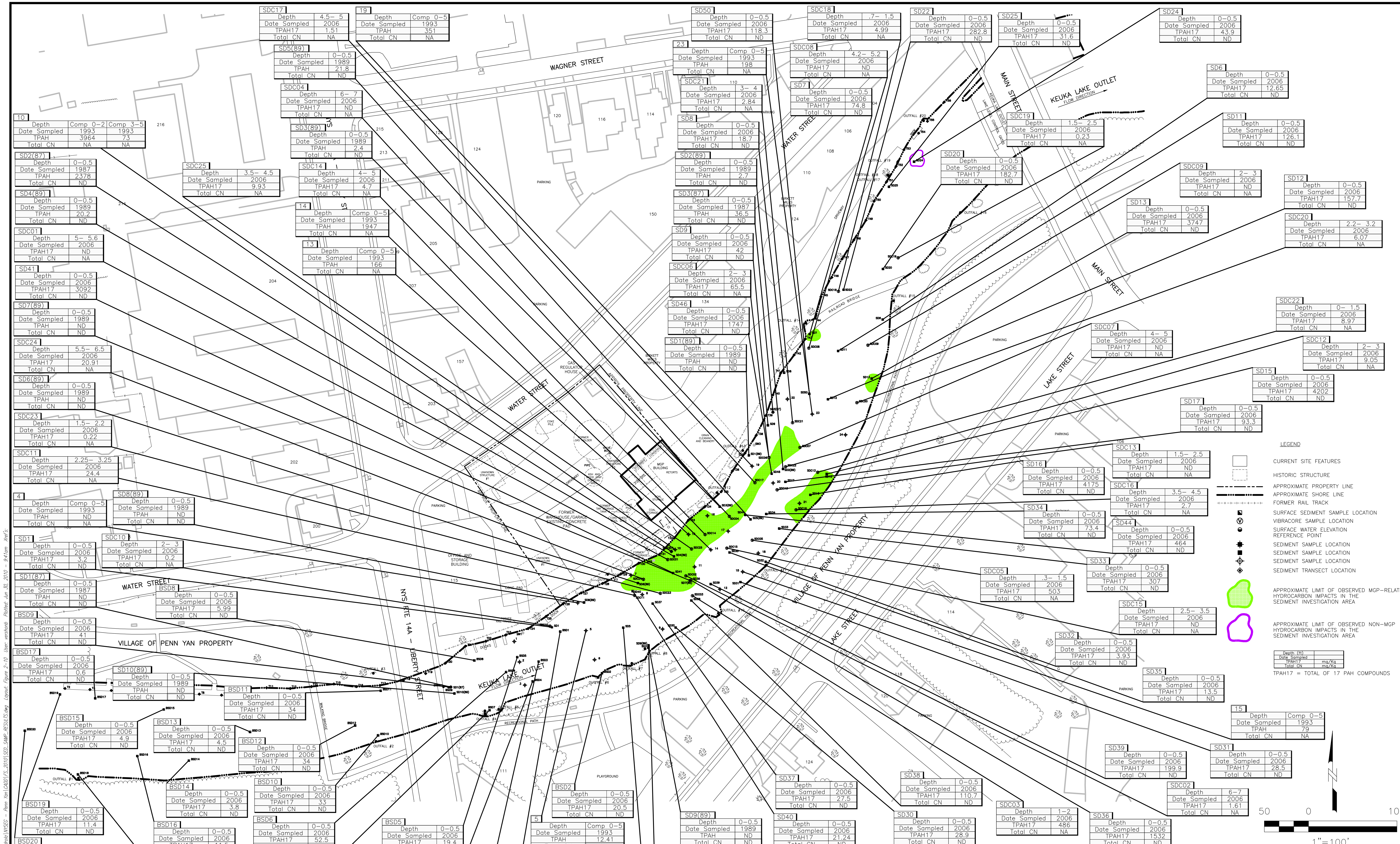
AECOM

PENN YAN WATER STREET
FORMER MGP SITE
FS REPORT

GROUNDWATER RESULTS - OCTOBER 2006
SURFACE WATER RESULTS - MAY 1989
PENN YAN, NEW YORK

DATE: 05/14/10 | DRWN: KPB | | **2-9**

File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG - Penn Yan\CADD\FS_2010\GW_SW_RESULTS.dwg Layout: Figure 2-9 User: vershonb Plotted: Jun 30, 2010 - 9:38am Xref's:



AECOM

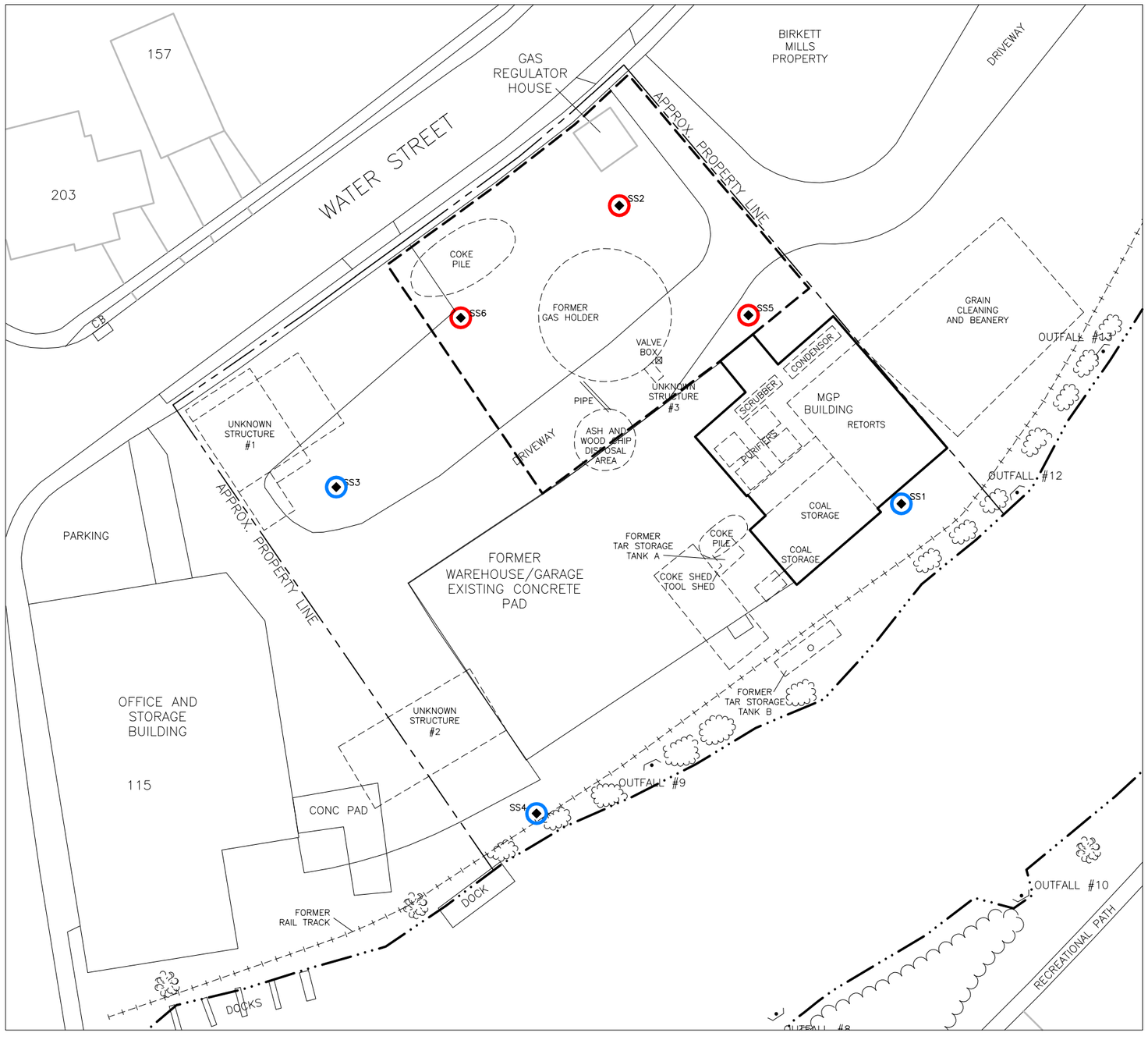
PENN YAN WATER STREET
FORMER MGP SITE

FS REPORT

DATE: 05/14/10 DRWN: KPB

SEDIMENT SAMPLE RESULTS
PENN YAN, NEW YORK

2-10



LEGEND

- CURRENT SITE FEATURES
- HISTORIC STRUCTURE
- APPROXIMATE PROPERTY LINE
- APPROXIMATE SHORE LINE
- FORMER RAIL TRACK
- SURFACE SOIL SAMPLE LOCATION
- LOCATIONS WHERE SURFACE SOIL COC CONCENTRATIONS EXCEED SCOs FOR COMMERCIAL SITES
- LOCATIONS WHERE SURFACE SOIL COC CONCENTRATIONS DO NOT EXCEED SCOs FOR COMMERCIAL SITES
- LIMITS OF SURFACE SOIL EXCEEDING REMEDIAL ACTION CRITERIA

N

20 0 40

1"=40'

AECOM

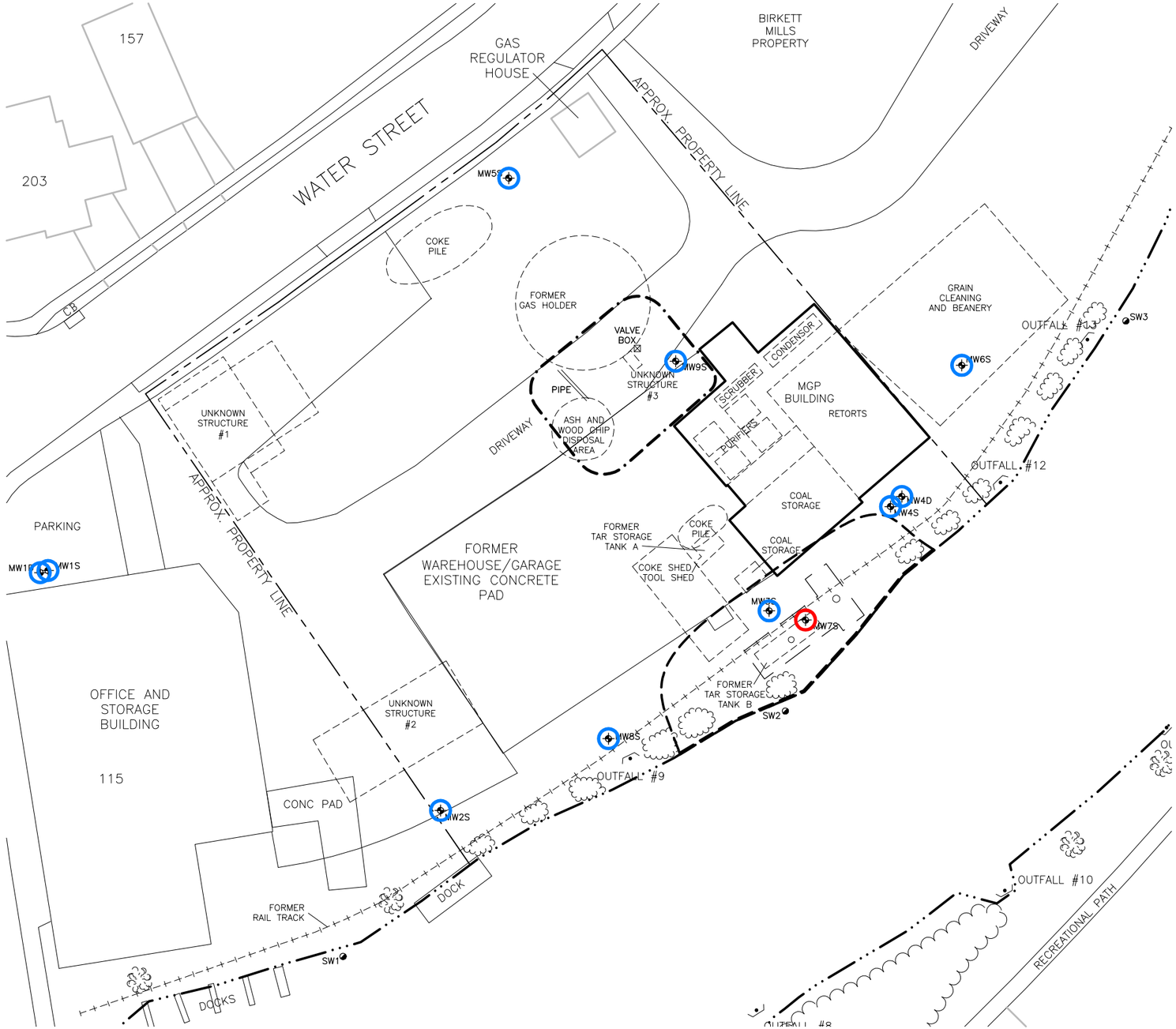
PENN YAN WATER STREET FORMER MGP SITE FS REPORT			**LIMITS OF SURFACE SOIL EXCEEDING REMEDIAL ACTION CRITERIA PENN YAN, NEW YORK**
DATE: 05/14/10	DRWN: KPB		**3-1**

File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG - Penn Yan\CADD\FS_2010\LIMITS_SURF_SOIL_CRITERIA.dwg Layout: Figure 3-1 User: vershonb Plotted: Jun 30, 2010 - 9:44am Xref's:

AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			**LIMITS OF SUBSURFACE SOIL EXCEEDING REMEDIAL ACTION CRITERIA PENN YAN, NEW YORK**
DATE: 05/14/10	DRWN: KPB		**3-2**

File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG - Penn Yan\CADD\FS_2010\LIMITS_SUBSURF_CRITERIA.dwg Layout: Figure 3-2 User: vershonb Plotted: Jun 30, 2010 - 10:53am Xref's:



LEGEND

- CURRENT SITE FEATURES
- HISTORIC STRUCTURE
- APPROXIMATE PROPERTY LINE
- APPROXIMATE SHORE LINE
- FORMER RAIL TRACK
- MONITORING WELL
- APPROXIMATE LOCATION SURFACE WATER SAMPLE –PREVIOUS INVESTIGATION
- MONITORING WELL WHERE CONCENTRATIONS OF COCs IN GROUNDWATER EXCEED STANDARDS
- MONITORING WELL WHERE CONCENTRATIONS OF COCs IN GROUNDWATER DO NOT EXCEED STANDARDS
- LIMITS OF GROUNDWATER EXCEEDING REMEDIAL ACTION CRITERIA
- LIMITS OF GROUNDWATER POTENTIALLY EXCEEDING REMEDIAL ACTION CRITERIA

N

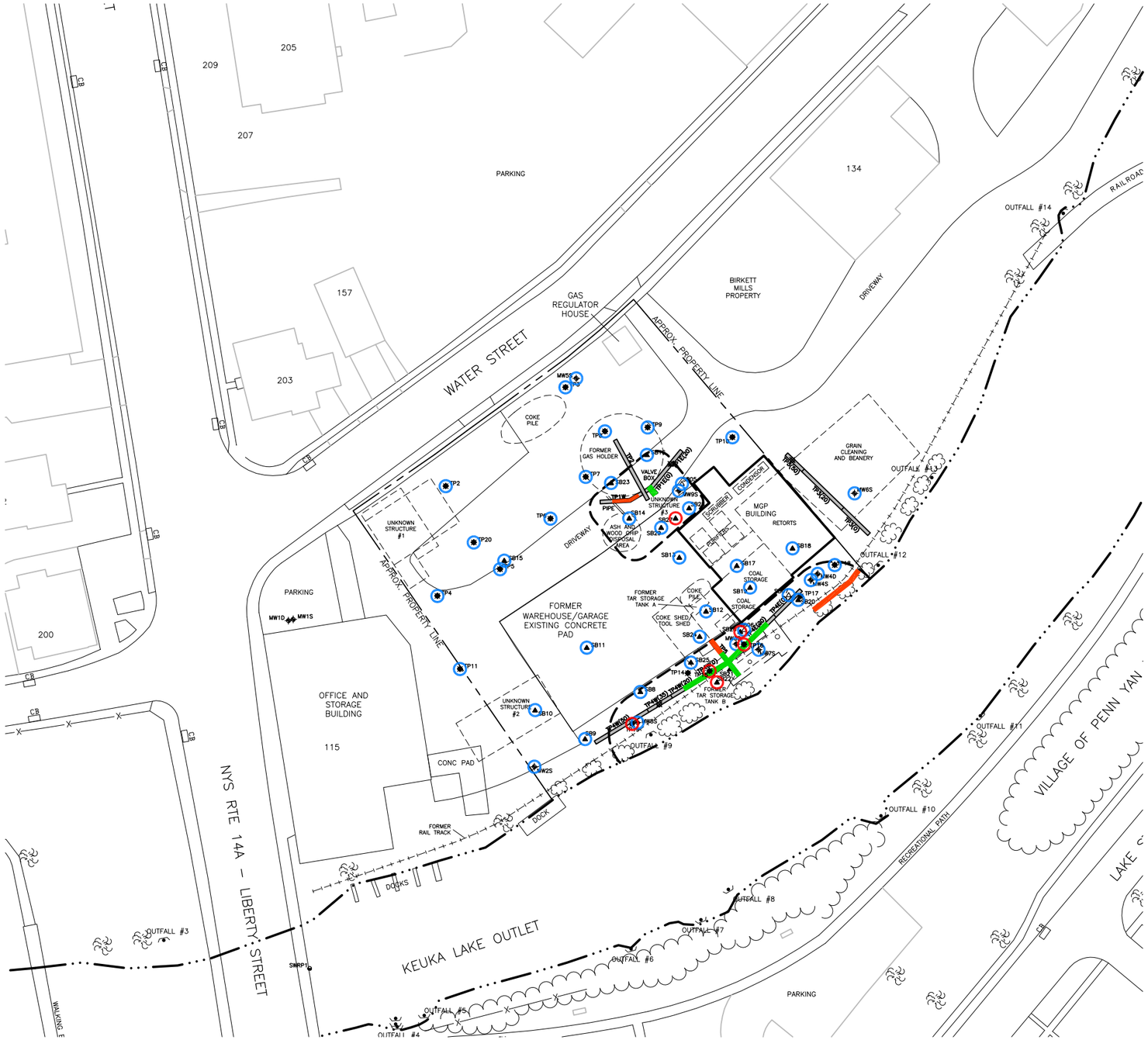
20 0 40

1"=40'

AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			**LIMITS OF GROUNDWATER EXCEEDING REMEDIAL ACTION CRITERIA PENN YAN, NEW YORK**
DATE: 05/14/10	DRWN: KPB		**3-3**

File: J:\Rem_Eng\Project Files\Iberdrola\NYSEG - Penn Yan\CADD\FS_2010\LIMITS_GW_CRITERIA.dwg Layout: Figure 3-3 User: vershonb Plotted: Jun 30, 2010 - 10:00am Xref's:



LEGEND

- CURRENT SITE FEATURES
- HISTORIC STRUCTURE
- APPROXIMATE PROPERTY LINE
- APPROXIMATE SHORE LINE
- FORMER RAIL TRACK
- MONITORING WELL
- SOIL BORING LOCATION
- TEST TRENCH LABORATORY SAMPLE LOCATION
- TEST PIT LOCATION – PREVIOUS INVESTIGATION
- SOIL BORING LOCATION – PREVIOUS INVESTIGATION
- TEST TRENCH LOCATION
- LOCATION WHERE SOIL DOES NOT EXCEED VISUAL CRITERIA
- LOCATION WHERE SOIL EXCEEDS VISUAL CRITERIA
- LIMITS OF SUBSURFACE SOIL EXCEEDING VISUAL CRITERIA
- HEAVY COAL TAR STAIN, SHEEN OR NAPL BLEBS
- COAL TAR OR COAL TAR/NAPL SATURATED SOIL

N

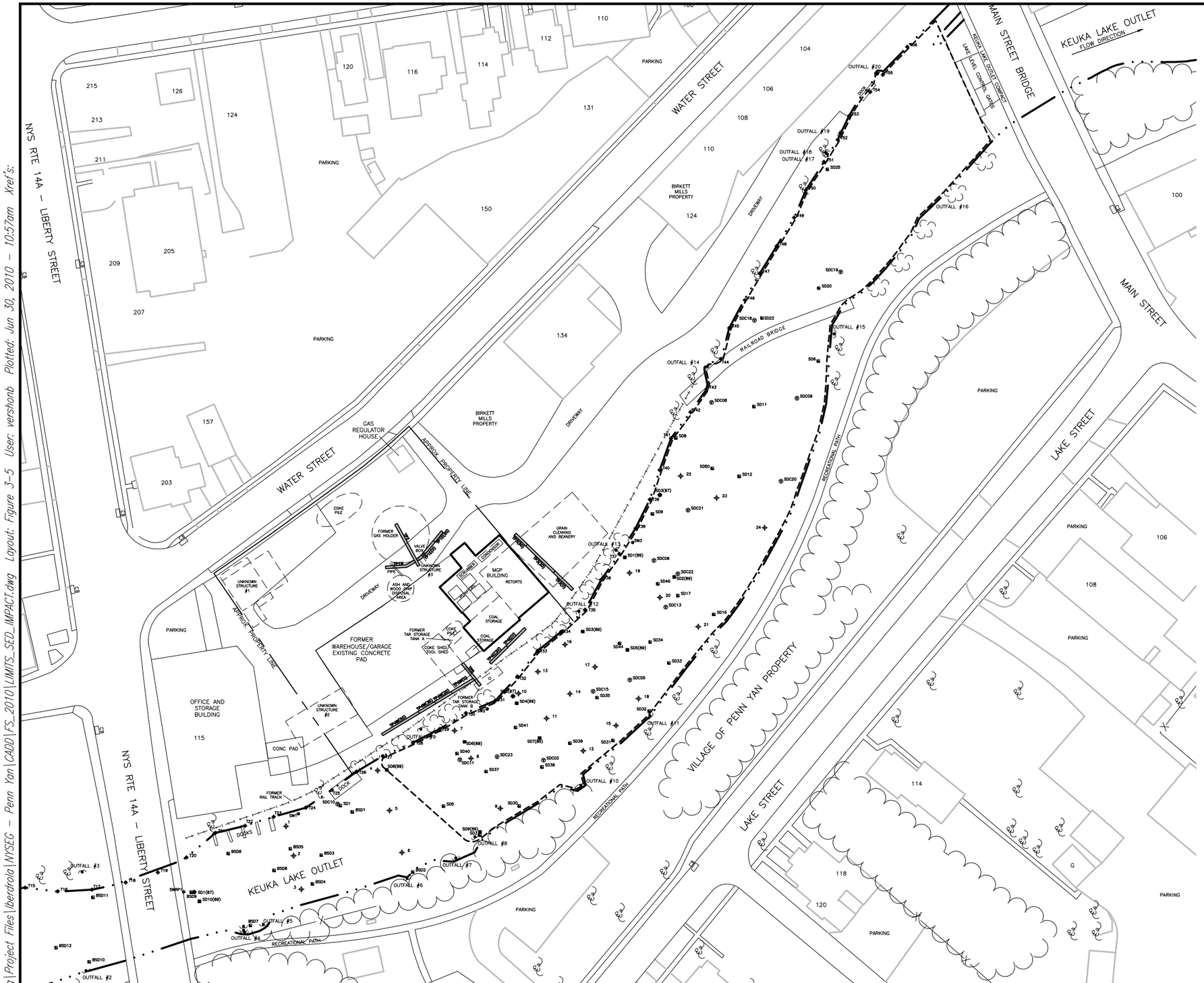
20 0 40

1"=40'

AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			LIMITS OF SUBSURFACE SOIL EXCEEDING NAPL CRITERIA PENN YAN, NEW YORK
DATE: 05/14/10	DRWN: KPB		3-4

File: J:\Rem_Eng\Project Files\Iberdrola\WYSEG – Penn Yan\CADD\FS_2010\LIMITS_SUBSURF_VISUAL_CRITERIA.dwg Layout: Figure 3-4 User: vershonb Plotted: Jun 30, 2010 – 10:55am Xref's:



LEGEND

- CURRENT SITE FEATURES
- HISTORIC STRUCTURE
- APPROXIMATE PROPERTY LINE
- APPROXIMATE SHORE LINE
- FORMER RAIL TRACK
- SURFACE SEDIMENT SAMPLE LOCATION 2006
- VIBRACORE SAMPLE LOCATION 2006
- SURFACE WATER ELEVATION REFERENCE POINT
- APPROXIMATE LOCATION SURFACE WATER SAMPLE –PREVIOUS INVESTIGATION
- SEDIMENT SAMPLE LOCATION 1987
- SEDIMENT SAMPLE LOCATION 1989
- SEDIMENT SAMPLE LOCATION 1993
- TEST TRENCH LOCATION
- SEDIMENT TRANSECT LOCATION
- LIMITS OF SEDIMENT IMPACTED BY PAST MGP OPERATIONS

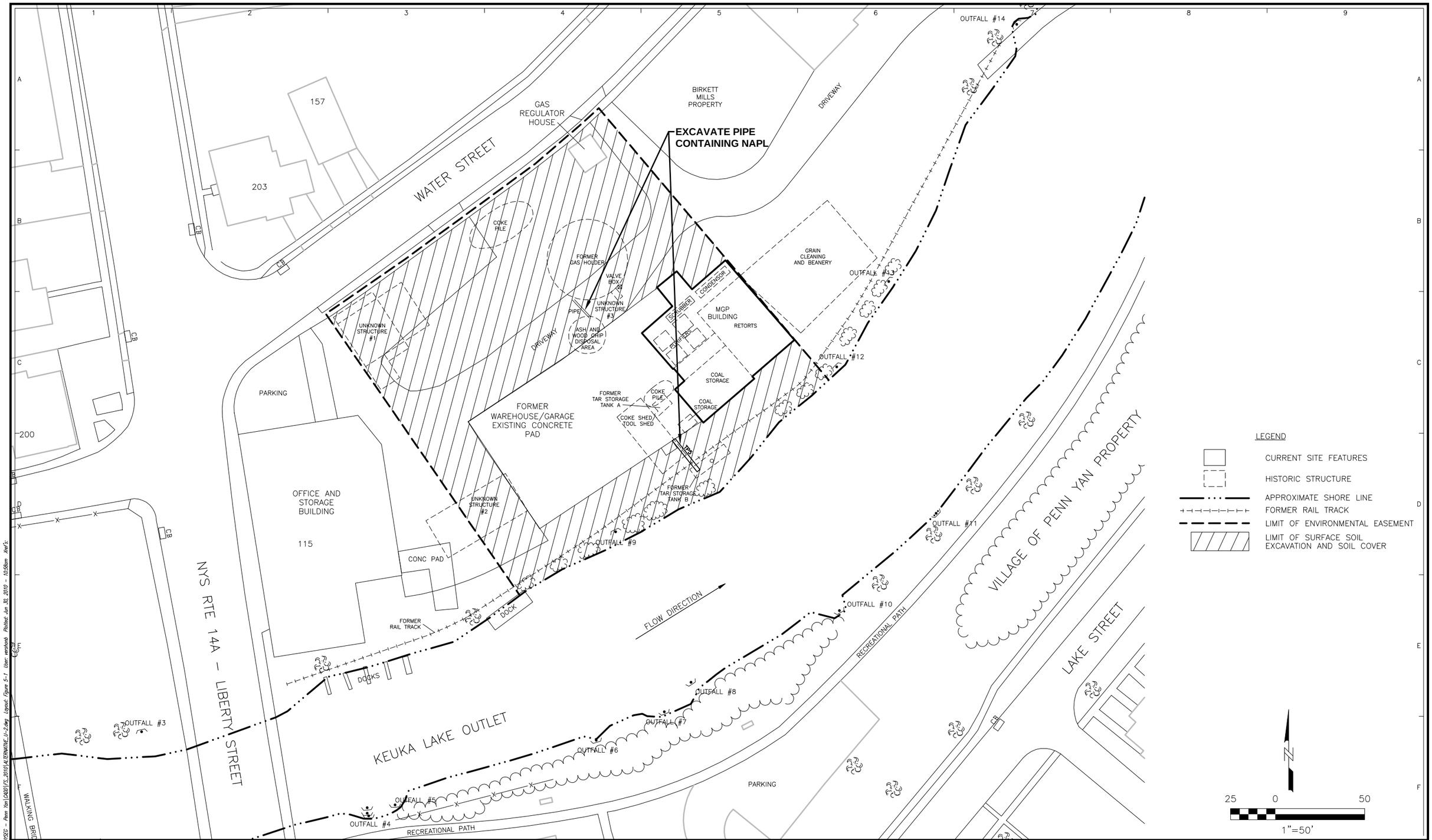
N

40 0 80

1"=80'

AECOM

PENN YAN WATER STREET FORMER MGP SITE FS REPORT			**LIMITS OF SEDIMENT IMPACTED BY PAST MGP OPERATIONS PENN YAN, NEW YORK**
DATE: 05/14/10	DRWN: KPB		**3-5**



NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
7							
6							
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2							
1							
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2 Technology Park Drive
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PENN YAN WATER STREET
FORMER MGP SITE
PENN YAN, NEW YORK

PROJ. NUMBER: 60149563

DATE: 05/14/10

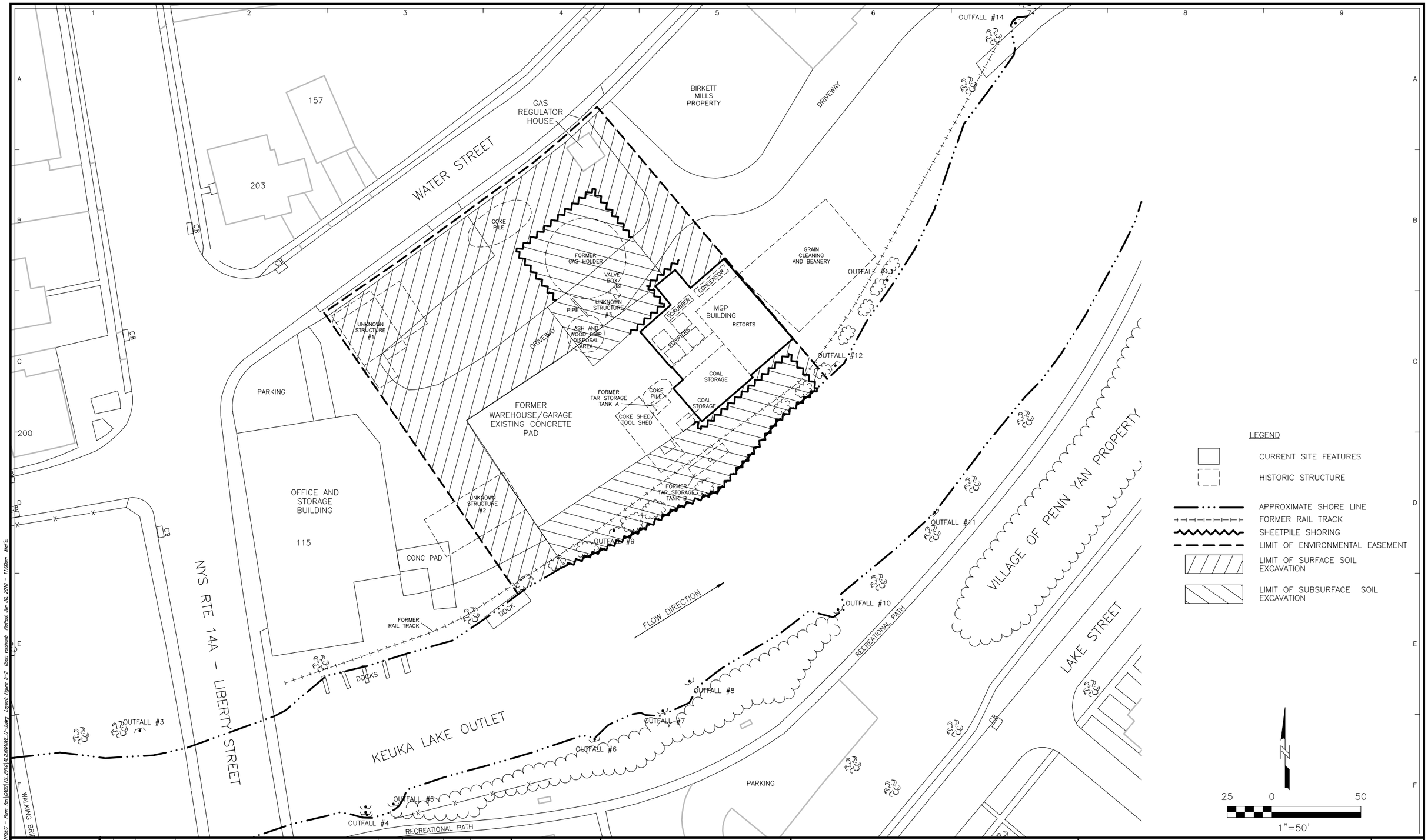
ALTERNATIVE U-2 - INSTITUTIONAL CONTROLS, EXCAVATION OF SURFACE SOIL, REMOVAL OF SUBSURFACE PIPING, SOIL COVER AND MNA OF GROUNDWATER

FS REPORT

DRAWING NUMBER: 5-1

SHEET NUMBER: 1

REVISION: 0



NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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DATE: 05/14/10

ALTERNATIVE U-3 - EXCAVATION OF SURFACE SOIL AND VISUALLY IMPACTED SUBSURFACE SOIL, REMOVAL OF SUBSURFACE PIPING, AND MNA OF GROUNDWATER

FS REPORT

DRAWING NUMBER: 5-2

SHEET NUMBER: 1

REVISION: 0

WATER STREET
APPROX. PROPERTY LINE
GAS REGULATOR HOUSE
BIRKETT MILLS PROPERTY
DRIVEWAY
157
203
CB
COKE PILE
FORMER GAS HOLDER
VALVE BOX
UNKNOWN STRUCTURE #3
PIPE
SCRUBBER
CONDENSOR
MGP BUILDING
RETORTS
PURIFIERS
GRAIN CLEANING AND BEANERY
OUTFALL #14
OUTFALL #13
OUTFALL #12
UNKNOWN STRUCTURE #1
ASH AND WOOD CHIP DISPOSAL AREA
DRIVEWAY
APPROX. PROPERTY LINE
PARKING
COAL STORAGE
FORMER TAR STORAGE TANK A
COKE PILE
COKE SHED TOOL SHED
FORMER WAREHOUSE/GARAGE EXISTING CONCRETE PAD
FORMER TAR STORAGE TANK B
UNKNOWN STRUCTURE #2
OUTFALL #9
OUTFALL #11
VILLAGE OF PENN YAN PROPERTY
200
OFFICE AND STORAGE BUILDING
115
CONC PAD
DOCK
FLOW DIRECTION
OUTFALL #10
RECREATIONAL PATH
FORMER RAIL TRACK
DOCKS
OUTFALL #8
OUTFALL #7
OUTFALL #6
OUTFALL #5
OUTFALL #4
OUTFALL #3
KEUKA LAKE OUTLET
NYS RTE 14A - LIBERTY STREET
LAKE STREET
PARKING
WALKING BRIDGE

LEGEND

- CURRENT SITE FEATURES
- HISTORIC STRUCTURE
- APPROXIMATE PROPERTY LINE
- APPROXIMATE SHORE LINE
- FORMER RAIL TRACK
- SHEETPILE SHORING
- LIMIT OF SURFACE SOIL EXCAVATION
- LIMIT OF SUBSURFACE SOIL EXCAVATION

N

25 0 50

1"=50'

NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
7							
6							
5							
4							
3							
2							
1							
0							

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PROJ. NUMBER: 60149563

DATE: 05/14/10

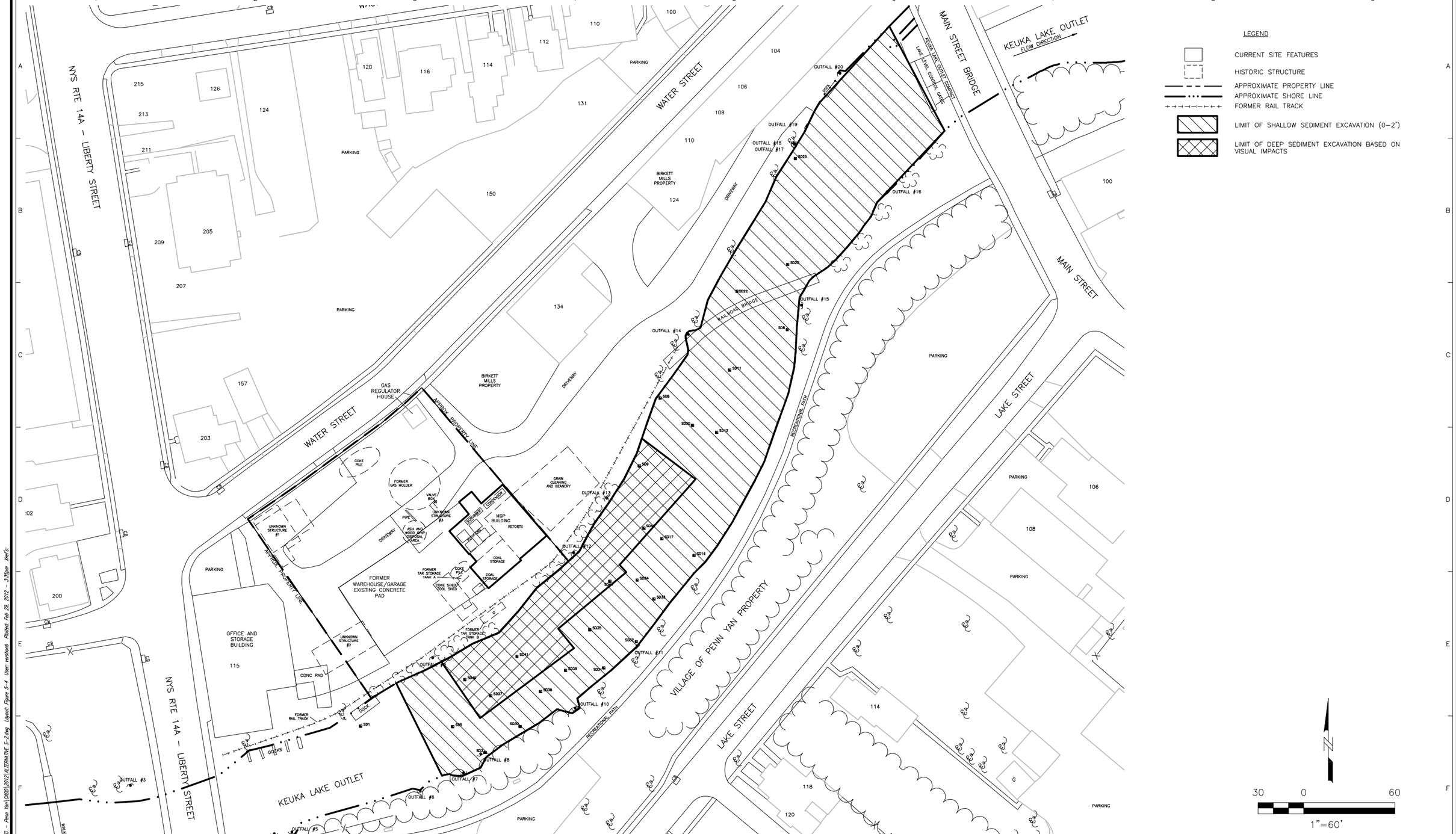
ALTERNATIVE U-4 - EXCAVATION OF SURFACE SOIL AND SUBSURFACE SOIL WHICH EXCEEDS UN- RESTRICTED USE SCOs, REMOVAL OF SUBSURFACE STRUCTURES

FS REPORT

DRAWING NUMBER: 5-3

SHEET NUMBER: 1

REVISION: 0



NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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6							
5							
4							
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2							
1							
0							

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PROJ. NUMBER: 60149563

DATE: 02/29/12

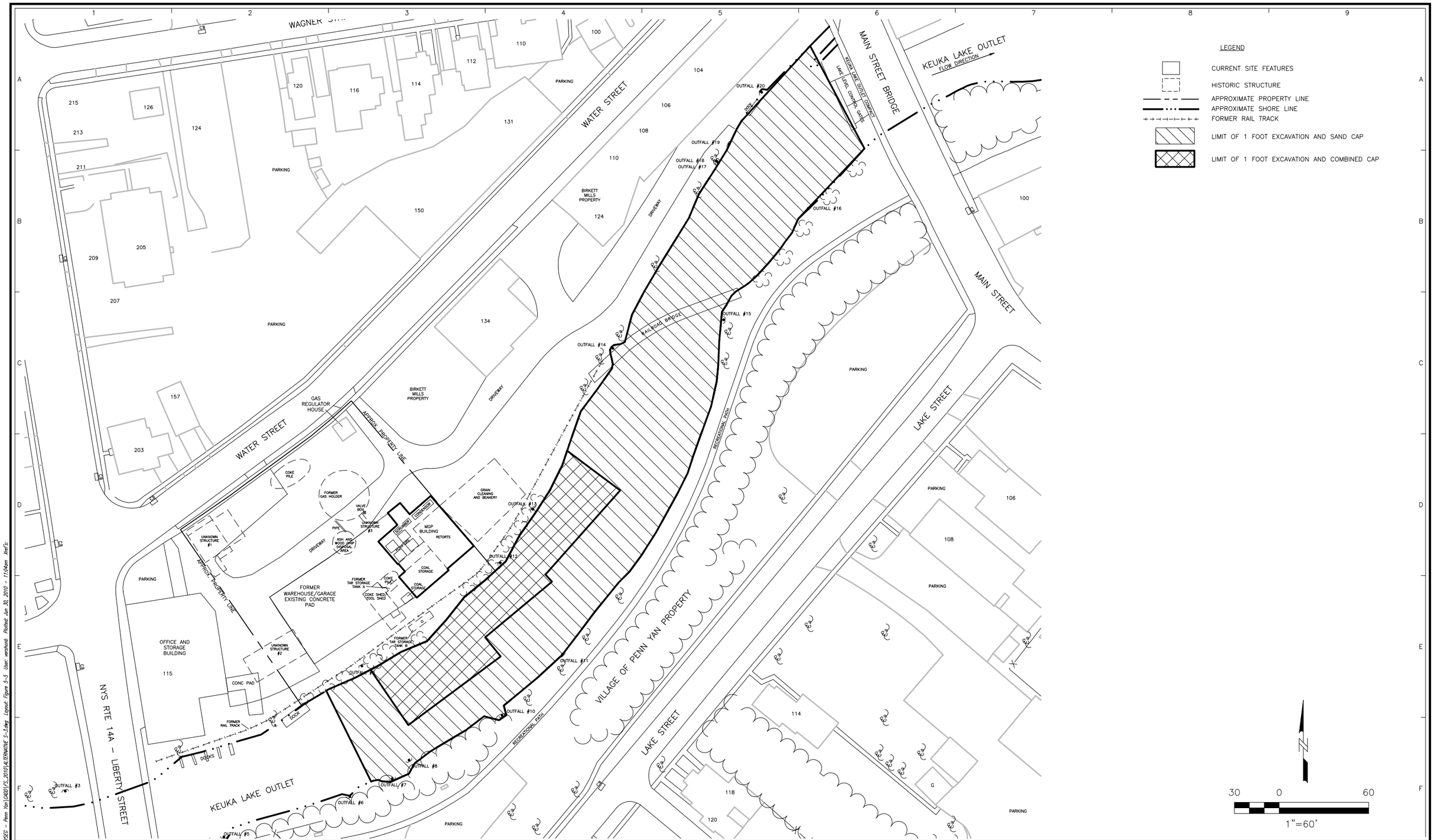
ALTERNATIVE S-2 - EXCAVATION/DREDGING OF VISUALLY IMPACTED SEDIMENT

FS REPORT

DRAWING NUMBER 5-4

SHEET NUMBER 1

REVISION 0



NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
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6							
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4							
3							
2							
1							
0							

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PENN YAN, NEW YORK

PROJ. NUMBER: 60149563

DATE: 05/14/10

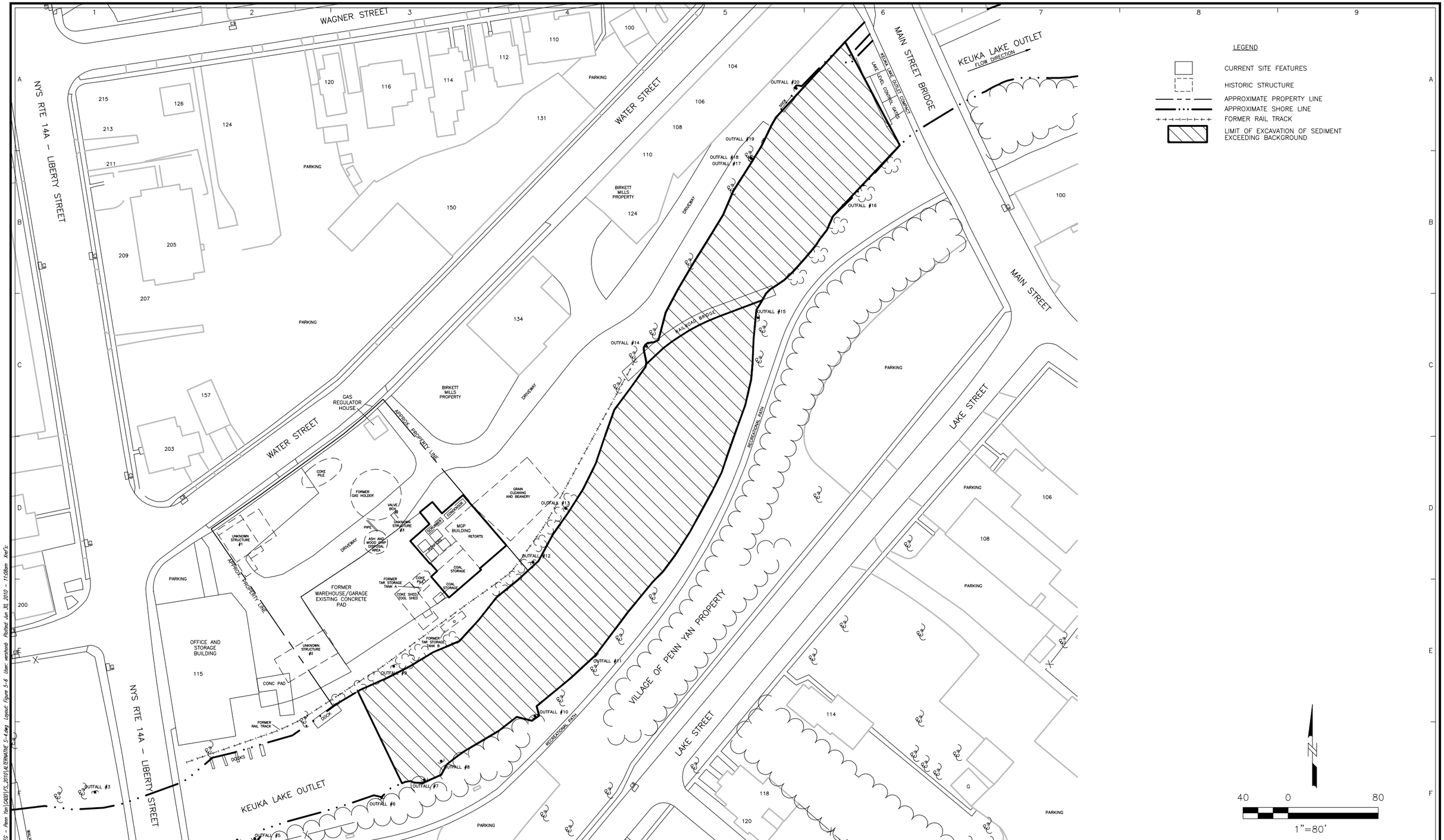
ALTERNATIVE S-3 - EXCAVATION/DREDGING OF SHALLOW SEDIMENT AND SUBAQUEOUS CAPPING

FS REPORT

DRAWING NUMBER 5-5

SHEET NUMBER: 1

REVISION 0



NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
7							
6							
5							
4							
3							
2							
1							
0							

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PENN YAN WATER STREET
FORMER MGP SITE
PENN YAN, NEW YORK

PROJ. NUMBER: 60149563

DATE: 05/14/10

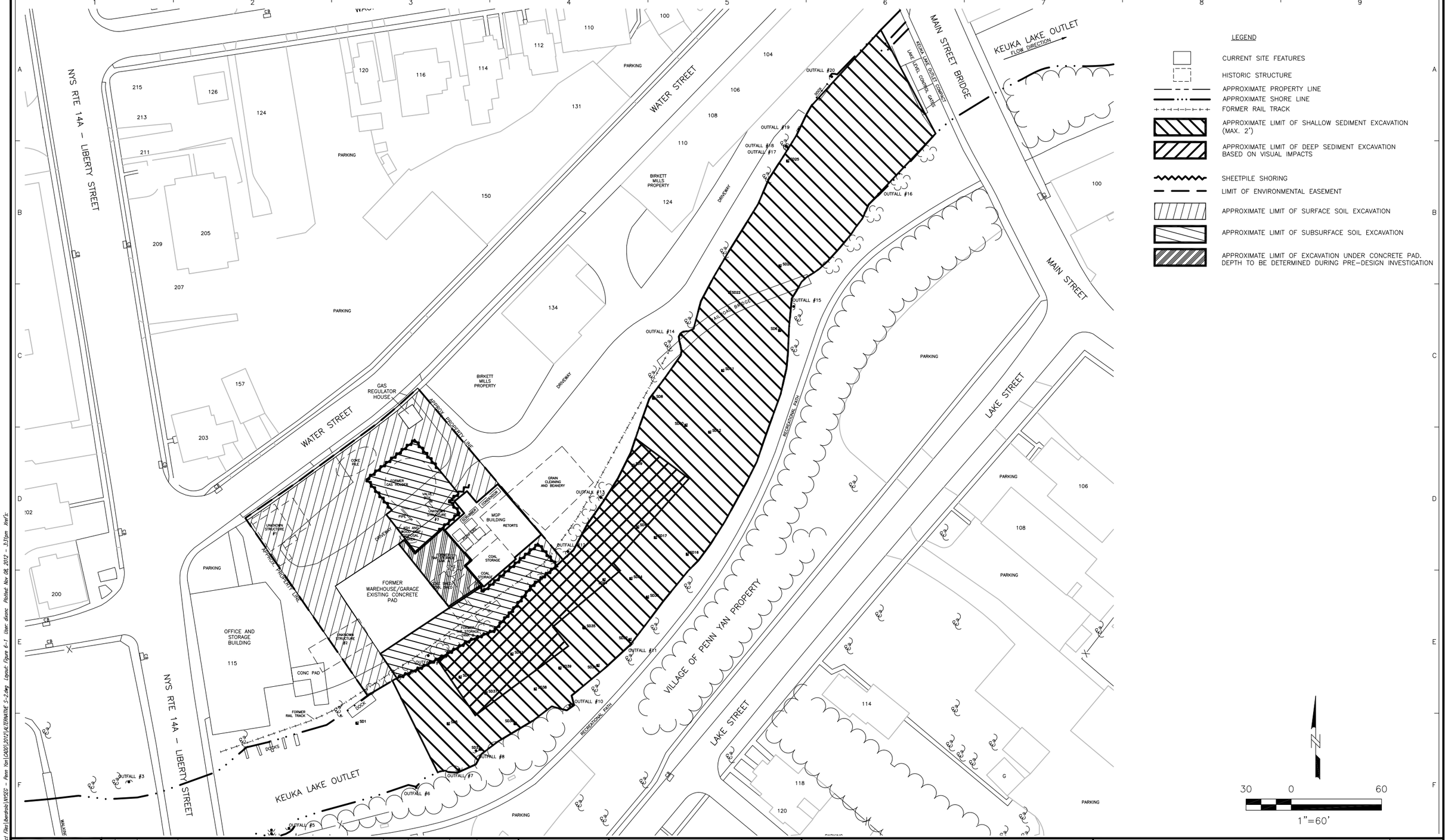
ALTERNATIVE S-4
FULL EXCAVATION/DREDGING OF IMPACTED SEDIMENT AND PLACEMENT OF BACKFILL

FS REPORT

DRAWING NUMBER 5-6

SHEET NUMBER 1

REVISION 0



NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
7							
6							
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4							
3							
2							
1							
0							

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PENN YAN WATER STREET
FORMER MGP SITE
PENN YAN, NEW YORK

PROJ. NUMBER: 60149563

DATE: 08/20/2012

RECOMMENDED ALTERNATIVE

FS REPORT

DRAWING NUMBER: 6-1

SHEET NUMBER: 1

REVISION: 0

File: \\Uswil1fp001\Jobs\Work_Eng\Project Files (Iocations)\NYSEG - Penn Yan\CAD\LDR12\ALTERNATIVE 5-2.dwg Layout: Figure 6-1 User: dconc PlotTed: Nov 08, 2012 - 3:31pm Ref's:

Appendix A

Sediment Background Concentration Calculations

Raw Data Set w/o outfall samples

Sample ID	TPAH17	ln(TPAH17)	
BSD01-06	9.54	2.255493	
BSD03-06	21.9	3.086487	
BSD04-06	23.65	3.163363	
BSD05-06	29.4	3.380995	
BSD06-06	56.5	4.034241	
BSD08-06	6.59	1.885553	Low Outlier
BSD09-06	257	5.549076	High Outlier
BSD12-06	132	4.882802	High Outlier
BSD13-06	20.5	3.020425	
BSD14-06	19.8	2.985682	
BSD15-06	25.9	3.254243	
BSD16-06	43	3.7612	
BSD17-06	21.6	3.072693	
BSD19-06	20.4	3.015535	
BSD20-06	23.9	3.173878	
BSD50-06	41.7	3.730501	

From ProUCL

Summary Statistics for Log-Transformed Full Dataset

NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
16	1.886	5.549	3.391	3.169	0.791	0.889	0.293	0.933	1.67	0.262

Percentiles for Log-Transformed Full Dataset

NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
16	1.886	2.108	2.992	3.016	3.163	3.731	3.755	4.374	5.016	5.442

Outlier Range	
IQR	0.715
1.5*IQR	1.0725
Lower Lim	1.9435
Upper Lim	4.8035

Data Set without Outfalls or Outliers

Sample ID	TPAH17	ln(TPAH17)
BSD01-06	9.54	2.255493
BSD03-06	21.9	3.086487
BSD04-06	23.65	3.163363
BSD05-06	29.4	3.380995
BSD06-06	56.5	4.034241
BSD13-06	20.5	3.020425
BSD14-06	19.8	2.985682
BSD15-06	25.9	3.254243
BSD16-06	43	3.7612
BSD17-06	21.6	3.072693
BSD19-06	20.4	3.015535
BSD20-06	23.9	3.173878
BSD50-06	41.7	3.730501

From ProUCL

Summary Statistics for Log-Transformed Full Dataset

NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
13	2.255	4.034	3.226	3.163	0.196	0.443	0.219	-0.156	1.333	0.137

Percentiles for Log-Transformed Full Dataset

	NumObs	5%ile	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
	13	2.255	2.475	3.004	3.017	3.125	3.349	3.521	**3.752**	3.857	3.999
mg/kg		9.5	11.9	20.2	20.4	22.8	28.5	33.8	**42.6**	47.3	54.5

Appendix B

Soil Data Summary Table

Contaminant	Concentration Range Detected (ppm)	Unrestricted SCO	Frequency Exceeding Unrestricted SCO	Residential	Restricted-Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water	Frequency Exceeding Use-Based SCO
Arsenic	Max=36.2 Min=1.7	13 [c]	1.85%	16[f]	16[f]	16[f]	16[f]	13[f]	16[f]	1.85%
Barium	Max=129J Min= 12.7J	350 [c]	0%	350[f]	400	400	10,000 [d]	433	820	0%
Beryllium	Max=1.0U Min=0.48U	7.2	0%	14	72	590	2,700	10	47	0%
Cadmium	Max=1.0U Min=0.47U	2.5 [c]	0%	2.5[f]	4.3	9.3	60	4	7.5	0%
Chromium, hexavalent [h]	Max= 25.5 Min= 3.7	1[b]	0%	22	110	400	800	1[e]	19	0%
Chromium, trivalent[h]	NA	30 [c]	NA	36	180	1,500	6,800	41	NS	NA
Copper	Max=80.2 Min=4.7	50	1.85%	270	270	270	10,000 [d]	50	1,720	0%
Total Cyanide [h]	Max=8.2 Min=0.60	27	0%	27	27	27	10,000 [d]	NS	40	0%
Lead	Max=162 Min=2.6J	63 [c]	16.6%	400	400	1,000	3,900	63[f]	450	0%
Manganese	Max=881J Min=91	1600 [c]	0%	2,000[f]	2,000[f]	10,000 [d]	10,000 [d]	1600[f]	2,000[f]	0%
Total Mercury	Max=0.533 Min=0.0010	0.18 [c]	3.7%	0.81[j]	0.81[j]	2.8[j]	5.7[j]	0.18[f]	0.73	0%
Nickel	Max=33.7J Min=5.3	30	3.7%	140	310	310	10,000 [d]	30	130	0%

Contaminant	Concentration Range Detected (ppm)	Unrestricted SCO	Frequency Exceeding Unrestricted SCO	Residential	Restricted-Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water	Frequency Exceeding Use-Based SCO
Selenium	Max=2.0U Min=0.93U	3.9[c]	0%	36	180	1,500	6,800	3.9[f]	4[f]	0%
Silver	Max=2.0U Min= 0.93U	2	0%	36	180	1,500	6,800	2	8.3	0%
Zinc	Max=134J Min=16.7	109 [c]	7.4%	2200	10,000 [d]	10,000 [d]	10,000 [d]	109[f]	2,480	0%
Acenaphthene	Max=11 Min=0.02J	20	0%	100[a]	100[a]	500[b]	1,000[c]	20	98	0%
Acenaphthylene	Max= 3U Min=0.02J	100 [a]	0%	100[a]	100[a]	500[b]	1,000[c]	NS	107	0%
Anthracene	Max= 3 Min=0.01	100 [a]	0%	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]	0%
Benz(a)anthracene	Max= 11 Min = 0.01J	1[c]	12.96%	1[f]	1[f]	5.6	11	NS	1[f]	3.70%
Benzo(a)pyrene	Max= 22 Min=0.03J	1[c]	11.1%	1[f]	1[f]	1[f]	1.1	2.6	22	11.1%
Benzo(b)fluoranthene	Max=29 Min=0.02J	1[c]	14.81%	1[f]	1[f]	5.6	11	NS	1.7	5.55%
Benzo(g,h,i)perylene	Max= 22 Min=0.04J	100	0%	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]	0%
Benzo(k)fluoranthene	Max=10 Min=0.03J	0.8 [c]	7.4%	1	3.9	56	110	NS	1.7	0%
Chrysene	Max=14 Min=0.02J	1[c]	11.1%	1[f]	3.9	56	110	NS	1[f]	0%

Contaminant	Concentration Range Detected (ppm)	Unrestricted SCO	Frequency Exceeding Unrestricted SCO	Residential	Restricted-Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water	Frequency Exceeding Use-Based SCO
Dibenz(a,h)anthracene	Max=6J Min=0.02J	0.33 [b]	7.4%	0.33[e]	0.33[e]	0.56	1.1	NS	1,000[c]	5.55%
Fluoranthene	Max=27 Min=.03J	100 [a]	0%	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]	0%
Fluorene	Max=9 Min=0.02J	30	0%	100[a]	100[a]	500[b]	1,000[c]	30	386	0%
Indeno(1,2,3-cd)pyrene	Max=22 Min=0.04J	0.5 [c]	18.5%	0.5[f]	0.5[f]	5.6	11	NS	8.2	3.7%
Naphthalene	Max=44 Min=0.03J	12	1.85%	100[a]	100[a]	500[b]	1,000[c]	NS	12	0%
Pentachlorophenol	Max=8U Min=0.4U	0.8[b]	0%	2.4	6.7	6.7	55	0.8[e]	0.8[e]	0%
Phenanthrene	Max=29 Min=0.02J	100	0%	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]	0%
Phenol	Max=8U Min=0.4U	0.33[b]	0%	100[a]	100[a]	500[b]	1,000[c]	30	0.33[e]	0%
Pyrene	Max=20 Min=0.02J	100	0%	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]	0%
1,1,1-Trichloroethane	Max=0.1J Min=0.005U	0.68	0%	100[a]	100[a]	500[b]	1,000[c]	NS	0.68	0%
1,1-Dichloroethane	Max=0.1U Min=0.005U	0.27	0%	19	26	240	480	NS	0.27	0%
1,1-Dichloroethene	Max=0.1U Min=0.005U	0.33	0%	100[a]	100[a]	500[b]	1,000[c]	NS	0.33	0%

Contaminant	Concentration Range Detected (ppm)	Unrestricted SCO	Frequency Exceeding Unrestricted SCO	Residential	Restricted-Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water	Frequency Exceeding Use-Based SCO
1,2-Dichlorobenzene	Max=8U Min=0.4U	1.1	0%	100[a]	100[a]	500[b]	1,000[c]	NS	1.1	0%
1,2-Dichloroethane	Max=0.1U Min=0.005U	0.02[c]	0%	2.3	3.1	30	60	10	0.02[f]	0%
1,3-Dichlorobenzene	Max=8U Min=0.4U	2.4	0%	17	49	280	560	NS	2.4	0%
1,4-Dichlorobenzene	Max=8U Min=0.4U	1.8	0%	9.8	13	130	250	20	1.8	0%
Acetone	Max=0.4 Min=0.006J	0.05	6.1%	100[a]	100[b]	500[b]	1,000[c]	2.2	0.05	0%
Benzene	Max=2 Min=0.005U	0.06	4%	2.9	4.8	44	89	70	0.06	0%
Carbon tetrachloride	Max=0.1U Min=0.005U	0.76	0%	1.4	2.4	22	44	NS	0.76	0%
Chlorobenzene	Max=0.1U Min=0.005U	1.1	0%	100[a]	100[a]	500[b]	1,000[c]	40	1.1	0%
Chloroform	Max=0.1U Min=0.005U	0.37	0%	10	49	350	700	12	0.37	0%
Ethylbenzene	Max=22 Min=0.001J	1	2%	30	41	390	780	NS	1	0%
Methylene chloride	Max=0.01 Min=0.007U	0.05	0%	51	100[a]	500[b]	1,000[c]	12	0.05	0%
Tetrachloroethene	Max=0.1U Min=0.005U	1.3	0%	5.5	19	150	300	2	1.3	0%

Contaminant	Concentration Range Detected (ppm)	Unrestricted SCO	Frequency Exceeding Unrestricted SCO	Residential	Restricted-Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water	Frequency Exceeding Use-Based SCO
Toluene	Max=4 Min=0.002J	0.7	4%	100[a]	100[a]	500[b]	1,000[c]	36	0.7	0%
Trichloroethene	Max=0.1U Min=0.005U	0.47	0%	10	21	200	400	2	0.47	0%
Vinyl chloride	Max=0.3U Min=0.01U	0.02	0%	0.21	0.9	13	27	NS	0.02	0%
Xylene (mixed)	Max=50 Min=0.005U	0.26	4%	100[a]	100[a]	500[b]	1,000[c]	0.26	1.6	0%

Appendix C

Cost Estimates

Project Name:	Penn Yan	**Revision No.:**	4
Cost Estimate No.:	U-2	**Date:**	6/9/10
Client	NYSEG	**Status:**	Draft
Location	Village of Penn Yan, NY	**Author:**	CCD
		Office:	WES
Project Element:	Upland Remediation	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Penn Yan, NY
Project Start Date:	
Project Duration:	1.5 MO
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Document Source: _____ **Rev. Date:** _____ **Site Visit?** no
Document Source: _____ **Rev. Date:** _____
Document Source: _____ **Rev. Date:** _____

Cost Summary

Prime Contractor Costs	**$**	**166,294**
Other Contracts & Purchases	**$**	**215,916**
Oversight Costs	**$**	**140,739**
Project Total Estimated Cost	**$**	**522,950**

Notes:

1. Note intended use and audience

2. List major project assumptions

3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

5. Values and costs are for informational purposes only. Values are not true costs because they represent a combination of fixed capital and quantity-proportional components

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Table 5-2
Alternative U-2 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-2 – Institutional/Engineering Controls, Excavation of Surface Soil, Removal of Subsurface Piping, Soil Cover, and MNA of Groundwater

Prime Contractor Costs								
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*20% Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$58,500*	*$11,700*	*$70,200*	*$70,200*	*42%*
2	*Fencing and E&S Control*	*LF*	*800*	*$14,800*	*$2,960*	*$17,760*	*$22*	*11%*
3	*Odor Contol Foam Consumables*	*MO*	*1*	*$7,120*	*$1,424*	*$8,544*	*$8,544*	*5%*
4	*Excavation and Material Handling*	*CY*	*1,060*	*$11,100*	*$2,220*	*$13,320*	*$13*	*8%*
5	*Backfill and Site Restoration*	*CY*	*1,332*	*$47,059*	*$9,412*	*$56,470*	*$42*	*34%*
				$138,579	*$27,716*	*$166,294*		*100%*
Other Contracts & Purchases								
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*20% Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*1,820*	*$179,930*	*$35,986*	*$215,916*	*$119*	*100%*
				$179,930	*$35,986*	*$215,916*		*100%*
Oversight Costs								
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*20% Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*1*	*$2,800*	*$560*	*$3,360*	*$3,360*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*4*	*$40,000*	*$8,000*	*$48,000*	*$12,000*	*34%*
3	*Personnel*	*Man Hours*	*575*	*$74,483*	*$14,897*	*$89,379*	*$155*	*64%*
				$117,283	*$23,457*	*$140,739*		*100%*
Grand Total						*$522,950*		

Penn Yan
U-2
NYSEG
Village of Penn Yan, NY

Upland Remediation

Add Task | Delete Row | Add 1 Blank Row

By: CCD Rev Date: 6/9/10

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost	
Prime Contractor Costs	NOTE- All costs include contractor Overhead and Profit					
1	**Mobilization**	**LS**	**1**		**$58,500.00**	
	Set-Up Temporary Utilitiy Services	LS	1	$10,000.00	$10,000.00	
	Mobilize Equipment to Site	LS	1	$7,000.00	$7,000.00	
	Construct Water Management	LS	1	$5,000.00	$5,000.00	
	Work Plans & Submittals	HR	80	$90.00	$7,200.00	
	Clear & Grub	LS	1	$4,000.00	$4,000.00	
	Labor Man Hrs.	Man hr	120	$65.00	$7,800.00	
	Site Survey	LS	1	$7,500.00	$7,500.00	
	Temporary Facilities	MO	1	$10,000.00	$10,000.00	
					$0.00	
2	**Fencing and E&S Control**	**LF**	**800**		**$14,800.00**	
	Privacy Fabric	SF	8000	$0.50	$4,000.00	
	Silt Fence	LF	800	$2.50	$2,000.00	
	Hay Bales	LF	800	$3.00	$2,400.00	
	Temporary Fencing	LF	800	$8.00	$6,400.00	
					$0.00	
3	**Odor Contol Foam Consumables**	**MO**	**1**		**$7,120.00**	
	Foam Unit Mob	LS	1	$500.00	$500.00	
	Foam Unit Rental	MO	1	$3,000.00	$3,000.00	
	Foam Labor	Day	5	$180.00	$900.00	
	Odor Control Foam	Drums	1	$2,000.00	$2,000.00	
	Biosolve Spray	Drums	2	$360.00	$720.00	
					$0.00	
4	**Excavation and Material Handling**	**CY**	**1060**		**$11,100.00**	
	Excavation of Surface Soils	CY	1010	$10.00	$10,100.00	
	Excavation of Subsurface Soils	CY	100	$10.00	$1,000.00	
					$0.00	
5	**Backfill and Site Restoration**	**CY**	**1332**		**$47,058.50**	
	Clean Fill Material	CY	726	$9.00	$6,534.00	
	Clean Topsoil Material	CY	606	$25.00	$15,150.00	
	Place & Compact	CY	1332	$6.00	$7,992.00	
	Compaction Testing	EA	3	$125.00	$337.50	
	Seed and Mulch	SF	28180	$0.25	$7,045.00	
	Misc Restoration	LS	1	$10,000.00	$10,000.00	
	SUB-TOTAL CONTRACTOR				**$138,578.50**	**$138,578.50**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$27,715.70**
	Total Subcontractor					**$166,294.20**
Other Contracts & Purchases						
1	**Waste Disposal**	**Ton**	**1820**		**$179,930.00**	
	Transportation and Offsite Thermal Treatment (ESMI of NY)	Ton	1730	$91.00	$157,430.00	
	Transportation and Disposal (HAZ)	Ton	90	$250.00	$22,500.00	
	SUB-TOTAL OTHER CONTRACTS				**$179,930.00**	**$179,930.00**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$35,986.00**
	Total Subcontractor					**$215,916.00**
Oversight Costs						
1	**Temporary Facilities**	**MO**	**1**		**$2,800.00**	
	Construction Support Facilities	MO	1	$2,800.00	$2,800.00	
					$0.00	
2	**Air Monitoring and Health and Safety**	**Weeks**	**4**		**$40,000.00**	
	Health and Safety and Air Monitoring	Weeks	4	$10,000.00	$40,000.00	
					$0.00	
3	**Personnel**	**Man Hours**	**575**		**$74,482.85**	
	Project Manager	HR	100	$130.00	$13,000.00	
	Construction Manager	HR	200	$85.00	$17,000.00	
	Engineer	HR	50	$85.00	$4,250.00	
	Administration (Home Office)	HR	25	$55.00	$1,375.00	
	Health and Safety Officer	HR	200	$75.00	$15,000.00	
	Travel Expenses	MO	1	$10,000.00	$10,000.00	
	Project Design (10% of Construction Cost w/o disposal fees)	LS	1	$13,857.85	$13,857.85	
	SUB-TOTAL Oversight COSTS				**$117,282.85**	**$117,282.85**
	Mark-up (ODCs Only)	0%			(no m/u on labor)	**$0.00**
	Contingency	20%				**$23,456.57**
	Total Oversight					**$140,739.42**

	GRAND TOTAL	**$522,949.62**

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Tabel 5-3
Alternative U-2 Operations, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-2 – Institutional/Engineering Controls, Excavation of Surface Soil, Removal of Subsurface Piping, Soil Cover, and MNA of Groundwater						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Bi-Annual Monitoring & Reporting (Yr. 0 to 2)	yr	2	$35,780.00	$64,690.89	Twice yearly sampling for years 1 and 2. See OM&M Detail Sheet for breakdown.
	Yearly Monitoring & Reporting (Yr. 3 to 8)	yr	5	$12,155.00	$50,604.67	Annual Sampling years 3 through 8. See OM&M Detail Sheet for breakdown.
	Annual Reports (Year 9 to 30)	yr	23	$3,210.00	$22,533.40	Annual Reports years 8 to 30. See OM&M Detail Sheet for breakdown.
	SUB-TOTAL OM&M				**$137,828.97**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$27,565.79**	
	Total OM&M				**$165,394.76**	

Unit Rate Back-Up and Notes

Years 0 to 2 Assume 10 monitoring wells to be sampled twice per year
Assume 10 samples collected from monitoring wells, 1 field duplicates, 1 MS, 1 MSD, 1 field blank and 1 trip blanks 7 samples total)

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Groundwater Monitoring (10 wells) (per sampling event)					
	Project Planning and Organizing		***Hr***			
	Project Manager (Oversight)	4	Hr	$ 120.00		$ 480.00
	Engineer (Oversight)	8	Hr	$ 90.00		$ 720.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Field Sampling Labor		***Hr***			
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Sampling Equipment, Shipping, Consumable Supplies		***Day***			
	Sample Shipping	1	Day	$ 200.00		$ 200.00
	Sampling Equipment (bailers, pumps)	1	LS	$ 100.00		$ 100.00
	Monitoring Equipment	1	LS	$ 100.00		$ 100.00
	PPE	2	Man Day	$ 25.00		$ 50.00
	Vehicle Rental	1	Day	$ 100.00		$ 100.00
	Per Diem (per person/day)	2	Man Day	$ 125.00		$ 250.00
	Miscellaneous	1	Day	$ 100.00		$ 100.00
	Sample Analysis and Data Validation		***Sample***			
	VOC analysis	10	Sample	$ 105.00		$ 1,050.00
	Inorganics analysis	10	Sample	$ 140.00		$ 1,400.00
	Natural attenuation parameter analysis	10	Sample	$ 300.00		$ 3,000.00
	Data Validation	10	Sample	$ 180.00		$ 1,800.00
	Data Evaluation and Reporting (Annual Report)	***60***	***Hr***			
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00
	Unit Rate	**Groundwater Monitoring (per event)**				**$ 17,890**
	Unit Rate	**Groundwater Monitoring (per year)**				**$ 35,780**

Years 3 to 8

Assume 3 monitoring wells to be sampled once per year
Assume 3 samples collected from monitoring wells, 1 field duplicates, 1 MS, 1 MSD, 1 field blank and 1 trip blanks 7 samples total)

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Groundwater Monitoring (3 wells) (per sampling event)					
	Project Planning and Organizing		***Hr***			
	Project Manager (Oversight)	4	Hr	$ 120.00		$ 480.00
	Engineer (Oversight)	8	Hr	$ 90.00		$ 720.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Field Sampling Labor		***Hr***			
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Sampling Equipment, Shipping, Consumable Supplies		***Day***			
	Sample Shipping	1	Day	$ 100.00		$ 100.00
	Sampling Equipment (bailers, pumps)	1	LS	$ 100.00		$ 100.00
	Monitoring Equipment	1	LS	$ 100.00		$ 100.00
	PPE	2	Man Day	$ 25.00		$ 50.00
	Vehicle Rental	1	Day	$ 100.00		$ 100.00
	Per Diem (per person/day)	2	Man Day	$ 125.00		$ 250.00
	Miscellaneous	1	Day	$ 100.00		$ 100.00
	Sample Analysis and Data Validation		***Sample***			
	VOC analysis	3	Sample	$ 105.00		$ 315.00
	Inorganics analysis	3	Sample	$ 140.00		$ 420.00
	Natural attenuation parameter analysis	3	Sample	$ 300.00		$ 900.00
	Data Validation	3	Sample	$ 180.00		$ 540.00
	Data Evaluation and Reporting (Annual Report)	***60***	***Hr***			
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00
	Unit Rate	**Groundwater Monitoring (per Event)**				**$ 12,155**

Annual Reports (year 9 to 30)

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Project Planning and Organizing		***Hr***			
	Project Manager	8	Hr	$ 120.00		$ 960.00
	Engineer	24	Hr	$ 90.00		$ 2,160.00
	Admin	2	Hr.	$ 45.00		$ 90.00
	Unit Rate	**Groundwater Monitoring (per event)**				**$ 3,210**

Project Name:	Penn Yan	**Revision No.:**	30
Cost Estimate No.:	U-3	**Date:**	6/9/10
Client	NYSEG	**Status:**	Draft
Location	Village of Penn Yan, NY	**Author:**	CCD
		Office:	WES
Project Element:	Upland Remediation	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Penn Yan, NY
Project Start Date:	
Project Duration:	2 MO
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Document Source: _____ **Rev. Date:** _____ **Site Visit?** no
Document Source: _____ **Rev. Date:** _____
Document Source: _____ **Rev. Date:** _____

Cost Summary

Prime Contractor Costs	**$**	**1,182,545**
Other Contracts & Purchases	**$**	**606,672**
Oversight Costs	**$**	**354,474**
Project Total Estimated Cost	**$**	**2,143,691**

Notes:

1. Note intended use and audience

2. List major project assumptions

3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

5. Values and costs are for informational purposes only. Values are not true costs because they represent a combination of fixed capital and quantity-proportional components

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Table 5-4
Alternative U-3 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-3 - Excavation of Surface Soil and Visually Impacted Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater								
Prime Contractor Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$312,800*	*$62,560*	*$375,360*	*$375,360*	*32%*
2	*Fencing and E&S Control*	*LF*	*800*	*$16,200*	*$3,240*	*$19,440*	*$24*	*2%*
3	*Odor Contol Foam Consumables*	*MO*	*1*	*$15,820*	*$3,164*	*$18,984*	*$18,984*	*2%*
4	*Excavation Shoring*	*SF*	*14,800*	*$513,600*	*$102,720*	*$616,320*	*$42*	*52%*
5	*Excavation Dewatering*	*WEEKS*	*2*	*$7,200*	*$1,440*	*$8,640*	*$4,320*	*1%*
6	*Excavation and Material Handling*	*CY*	*3,340*	*$33,400*	*$6,680*	*$40,080*	*$12*	*3%*
7	*Monitoring Well Installation*	*LF*	*30*	*$1,830*	*$366*	*$2,196*	*$73*	*0%*
8	*Backfill and Site Restoration*	*CY*	*3,906*	*$84,604*	*$16,921*	*$101,525*	*$26*	*9%*
				$985,454	*$197,091*	*$1,182,545*		*100%*
Other Contracts & Purchases					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*5,550*	*$505,560*	*$101,112*	*$606,672*	*$109*	*100%*
				$505,560	*$101,112*	*$606,672*		*100%*
Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*2*	*$5,600*	*$1,120*	*$6,720*	*$3,360*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*8*	*$80,000*	*$16,000*	*$96,000*	*$12,000*	*27%*
3	*Personnel*	*Man Hours*	*1,150*	*$209,795*	*$41,959*	*$251,754*	*$219*	*71%*
				$295,395	*$59,079*	*$354,474*		*100%*
Grand Total						*$2,143,691*		

Penn Yan
U-3
NYSEG
Village of Penn Yan, NY

Upland Remediation

Add Task | Delete Row | Add 1 Blank Row

By: CCD Rev Date: 6/9/10

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost	
Prime Contractor Costs	NOTE- All costs include contractor Overhead and Profit					
1	**Mobilization**	**LS**	**1**		**$312,800.00**	
	Set-Up Temporary Utilitiy Services	LS	1	$10,000.00	$10,000.00	
	Mobilize Equipment to Site	LS	1	$10,000.00	$10,000.00	
	Water Treatment System Mob & Setup	LS	1	$100,000.00	$100,000.00	
	Work Plans & Submittals	HR	120	$90.00	$10,800.00	
	Sheet Pile Contractor Mobilization	LS	1	$130,000.00	$130,000.00	
	Clear & Grub	LS	1	$4,000.00	$4,000.00	
	Labor Man Hrs.	Man hr	200	$65.00	$13,000.00	
	Site Survey	LS	1	$15,000.00	$15,000.00	
	Temporary Facilities	MO	2	$10,000.00	$20,000.00	
					$0.00	
2	**Fencing and E&S Control**	**LF**	**800**		**$16,200.00**	
	Privacy Fabric	SF	8000	$0.50	$4,000.00	
	Silt Fence	LF	800	$1.25	$1,000.00	
	Hay Bales	LF	800	$6.00	$4,800.00	
	Temporary Fencing	LF	800	$8.00	$6,400.00	
					$0.00	
3	**Odor Contol Foam Consumables**	**MO**	**1**		**$15,820.00**	
	Foam Unit Mob	LS	1	$500.00	$500.00	
	Foam Unit Rental	MO	1	$3,000.00	$3,000.00	
	Foam Labor	Day	10	$180.00	$1,800.00	
	Odor Control Foam	Drum	4	$2,000.00	$8,000.00	
	Biosolve Spray	Drums	7	$360.00	$2,520.00	
					$0.00	
4	**Excavation Shoring**	**SF**	**14800**		**$513,600.00**	
	Sheet Pile Material	SF	14800	$20.00	$296,000.00	
	Sheet Pile Installation/Removal	SF	14800	$12.00	$177,600.00	
	Pre-excavation & clearing of obstructions	LS	1	$20,000.00	$20,000.00	
	Sheetpile Design	LS	1	$20,000.00	$20,000.00	
					$0.00	
5	**Excavation Dewatering**	**WEEKS**	**2**		**$7,200.00**	
	Water Treatment System Weekly Maintenance	Week	2	$3,600.00	$7,200.00	
					$0.00	
6	**Excavation and Material Handling**	**CY**	**3340**		**$33,400.00**	
	Excavation of Surface Soils	CY	1020	$10.00	$10,200.00	
	Excavation of Subsurface Soils	CY	2320	$10.00	$23,200.00	
7	**Monitoring Well Installation**	**LF**	**30**		**$1,830.00**	
	Monitoring Well Installation and Development	LF	30	$61.00	$1,830.00	
					$0.00	
8	**Backfill and Site Restoration**	**CY**	**3906**		**$84,603.75**	
	Clean Fill Material	CY	3396	$9.00	$30,564.00	
	Clean Topsoil Material	CY	510	$25.00	$12,750.00	
	Place & Compact	CY	3906	$6.00	$23,436.00	
	Compaction Testing	EA	8	$125.00	$987.50	
	Seed and Mulch	SF	27465	$0.25	$6,866.25	
	Misc Restoration	LS	1	$10,000.00	$10,000.00	
	SUB-TOTAL CONTRACTOR				**$985,453.75**	**$985,453.75**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$197,090.75**
	Total Subcontractor					**$1,182,544.50**
Other Contracts & Purchases						
1	**Waste Disposal**	**Ton**	**5550**		**$505,560.00**	
	Transportation and Offsite Thermal Treatment (ESMI of NY)	Ton	5260	$91.00	$478,660.00	
	Transportation and Disposal (HAZ)	Ton	50	$250.00	$12,500.00	
	Transportation and Disposal (C&D)	Ton	240	$60.00	$14,400.00	
	SUB-TOTAL OTHER CONTRACTS				**$505,560.00**	**$505,560.00**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$101,112.00**
	Total Subcontractor					**$606,672.00**
Oversight Costs						
1	**Temporary Facilities**	**MO**	**2**		**$5,600.00**	
	Construction Support Facilities	MO	2	$2,800.00	$5,600.00	
					$0.00	
2	**Air Monitoring and Health and Safety**	**Weeks**	**8**		**$80,000.00**	
	Health and Safety and Air Monitoring	Weeks	8	$10,000.00	$80,000.00	
					$0.00	
3	**Personnel**	**Man Hours**	**1150**		**$209,795.38**	
	Project Manager	HR	200	$130.00	$26,000.00	
	Construction Manager	HR	400	$85.00	$34,000.00	
	Engineer	HR	100	$85.00	$8,500.00	

	Administration (Home Office)	HR	50	$55.00	$2,750.00	
	Health and Safety Officer	HR	400	$75.00	$30,000.00	
	Travel Expenses	MO	1	$10,000.00	$10,000.00	
	Project Design (10% of Construction Cost w/o disposal fees)	LS	1	$98,545.38	$98,545.38	
	SUB-TOTAL Oversight COSTS				**$295,395.38**	**$295,395.38**
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**
	Contingency	20%				**$59,079.08**
	Total Oversight					**$354,474.45**
	GRAND TOTAL					**$2,143,690.95**

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Table 5-5
Alternative U-3 Operations, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-3 - Excavation of Surface Soil and Subsurface Soil, Removal of Subsurface Piping, and MNA of Groundwater						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Bi-Annual Monitoring & Reporting (Yr. 0 to 2)	yr	2	$35,780.00	$64,690.89	Twice yearly sampling for years 1 and 2. See OM&M Detail Sheet for breakdown.
	Yearly Monitoring & Reporting (Yr. 3 to 8)	yr.	5	$12,155.00	$50,604.67	Annual Sampling years 3 through 8. See OM&M Detail Sheet for breakdown.
	Annual Reports (Year 9 to 30)	yr	23	$3,210.00	$22,533.40	Annual Reports years 8 to 30. See OM&M Detail Sheet for breakdown.
	SUB-TOTAL OM&M				**$137,828.97**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$27,565.79**	
	Total OM&M				**$165,394.76**	

Unit Rate Back-Up and Notes

Years 0 to 2 Assume 10 monitoring wells to be sampled twice per year
Assume 10 samples collected from monitoring wells, 1 field duplicates, 1 MS, 1 MSD, 1 field blank and 1 trip blanks 7 samples total)

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Groundwater Monitoring (10 wells) (per sampling event)					
	Project Planning and Organizing		***Hr***			
	Project Manager (Oversight)	4	Hr	$ 120.00		$ 480.00
	Engineer (Oversight)	8	Hr	$ 90.00		$ 720.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Field Sampling Labor		***Hr***			
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Sampling Equipment, Shipping, Consumable Supplies		***Day***			
	Sample Shipping	1	Day	$ 200.00		$ 200.00
	Sampling Equipment (bailers, pumps)	1	LS	$ 100.00		$ 100.00
	Monitoring Equipment	1	LS	$ 100.00		$ 100.00
	PPE	2	Man Day	$ 25.00		$ 50.00
	Vehicle Rental	1	Day	$ 100.00		$ 100.00
	Per Diem (per person/day)	2	Man Day	$ 125.00		$ 250.00
	Miscellaneous	1	Day	$ 100.00		$ 100.00
	Sample Analysis and Data Validation		***Sample***			
	VOC analysis	10	Sample	$ 105.00		$ 1,050.00
	Inorganics analysis	10	Sample	$ 140.00		$ 1,400.00
	Natural attenuation parameter analysis	10	Sample	$ 300.00		$ 3,000.00
	Data Validation	10	Sample	$ 180.00		$ 1,800.00
	Data Evaluation and Reporting (Annual Report)	***60***	***Hr***			
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00

Unit Rate **Groundwater Monitoring (per event)** **$ 17,890**
Unit Rate **Groundwater Monitoring (per year)** **$ 35,780**

Years 3 to 8

Assume 3 monitoring wells to be sampled once per year
Assume 3 samples collected from monitoring wells, 1 field duplicates, 1 MS, 1 MSD, 1 field blank and 1 trip blanks 7 samples total)

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Groundwater Monitoring (3 wells) (per sampling event)					
	Project Planning and Organizing		***Hr***			
	Project Manager (Oversight)	4	Hr	$ 120.00		$ 480.00
	Engineer (Oversight)	8	Hr	$ 90.00		$ 720.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Field Sampling Labor		***Hr***			
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Sampling Equipment, Shipping, Consumable Supplies		***Day***			
	Sample Shipping	1	Day	$ 100.00		$ 100.00
	Sampling Equipment (bailers, pumps)	1	LS	$ 100.00		$ 100.00
	Monitoring Equipment	1	LS	$ 100.00		$ 100.00
	PPE	2	Man Day	$ 25.00		$ 50.00
	Vehicle Rental	1	Day	$ 100.00		$ 100.00
	Per Diem (per person/day)	2	Man Day	$ 125.00		$ 250.00
	Miscellaneous	1	Day	$ 100.00		$ 100.00
	Sample Analysis and Data Validation		***Sample***			
	VOC analysis	3	Sample	$ 105.00		$ 315.00
	Inorganics analysis	3	Sample	$ 140.00		$ 420.00
	Natural attenuation parameter analysis	3	Sample	$ 300.00		$ 900.00
	Data Validation	3	Sample	$ 180.00		$ 540.00
	Data Evaluation and Reporting (Annual Report)	***60***	***Hr***			
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00

Unit Rate **Groundwater Monitoring (per Event)** **$ 12,155**

Annual Reports (year 9 to 30)

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Project Planning and Organizing		***Hr***			
	Project Manager	8	Hr	$ 120.00		$ 960.00
	Engineer	24	Hr	$ 90.00		$ 2,160.00
	Admin	2	Hr.	$ 45.00		$ 90.00

Unit Rate	**Groundwater Monitoring (per event)**	**$**	**3,210**

Project Name:	Penn Yan	**Revision No.:**	8
Cost Estimate No.:	U-4	**Date:**	6/14/10
Client	NYSEG	**Status:**	Draft
Location	Village of Penn Yan, NY	**Author:**	CCD
		Office:	WES
Project Element:	Upland Remediation	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Penn Yan, NY
Project Start Date:	
Project Duration:	1.5 MO
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Document Source: _____ **Rev. Date:** _____ **Site Visit?** no
Document Source: _____ **Rev. Date:** _____
Document Source: _____ **Rev. Date:** _____

Cost Summary

Prime Contractor Costs	**$**	**1,470,931**
Other Contracts & Purchases	**$**	**967,008**
Oversight Costs	**$**	**439,401**
Project Total Estimated Cost	**$**	**2,877,340**

Notes:

1. Note intended use and audience

2. List major project assumptions

3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

5. Values and costs are for informational purposes only. Values are not true costs because they represent a combination of fixed capital and quantity-proportional components

AECOM

Table 5-6
Alternative U-4 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-4 – Excavation of Surface Soil and Subsurface Soil Which Exceeds Unrestricted Use SCOs, Removal of Subsurface Piping, and MNA of Groundwater							
Prime Contractor Costs				20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$317,800*	*$63,560*	*$381,360*	*$381,360*	*26%*
2	*Fencing and E&S Control*	*LF*	*800*	*$16,200*	*$3,240*	*$19,440*	*$24*	*1%*
3	*Odor Contol Foam Consumables*	*MO*	*1*	*$23,060*	*$4,612*	*$27,672*	*$27,672*	*2%*
4	*Excavation Shoring*	*SF*	*19,440*	*$662,080*	*$132,416*	*$794,496*	*$41*	*54%*
5	*Excavation Dewatering*	*WEEKS*	*4*	*$14,400*	*$2,880*	*$17,280*	*$4,320*	*1%*
6	*Excavation and Material Handling*	*CY*	*5,340*	*$63,400*	*$12,680*	*$76,080*	*$14*	*5%*
7	*Backfill and Site Restoration*	*CY*	*6,408*	*$128,836*	*$25,767*	*$154,603*	*$24*	*11%*
				$1,225,776	*$245,155*	*$1,470,931*		*100%*
Other Contracts & Purchases					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*8,860*	*$805,840*	*$161,168*	*$967,008*	*$109*	*100%*
				$805,840	*$161,168*	*$967,008*		*100%*
Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*3*	*$7,000*	*$1,400*	*$8,400*	*$3,360*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*10*	*$100,000*	*$20,000*	*$120,000*	*$12,000*	*27%*
3	*Personnel*	*Man Hours*	*1,438*	*$259,168*	*$51,834*	*$311,001*	*$216*	*71%*
				$366,168	*$73,234*	*$439,401*		*100%*
Grand Total						*$2,877,340*		

Penn Yan
U-4
NYSEG
Village of Penn Yan, NY

Upland Remediation

Add Task | Delete Row | Add 1 Blank Row

By: CCD Rev Date: 6/14/10

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost	
Prime Contractor Costs	NOTE- All costs include contractor Overhead and Profit					
1	**Mobilization**	**LS**	**1**		**$317,800.00**	
	Set-Up Temporary Utilitiy Services	LS	1	$10,000.00	$10,000.00	
	Mobilize Equipment to Site	LS	1	$10,000.00	$10,000.00	
	Water Treatment System Mob & Setup	LS	1	$100,000.00	$100,000.00	
	Work Plans & Submittals	HR	120	$90.00	$10,800.00	
	Sheet Pile Contractor Mobilization	LS	1	$130,000.00	$130,000.00	
	Clear & Grub	LS	1	$4,000.00	$4,000.00	
	Labor Man Hrs.	Man hr	200	$65.00	$13,000.00	
	Site Survey	LS	1	$15,000.00	$15,000.00	
	Temporary Facilities	MO	2.5	$10,000.00	$25,000.00	
					$0.00	
2	**Fencing and E&S Control**	**LF**	**800**		**$16,200.00**	
	Privacy Fabric	SF	8000	$0.50	$4,000.00	
	Silt Fence	LF	800	$1.25	$1,000.00	
	Hay Bales	LF	800	$6.00	$4,800.00	
	Temporary Fencing	LF	800	$8.00	$6,400.00	
					$0.00	
3	**Odor Contol Foam Consumables**	**MO**	**1**		**$23,060.00**	
	Foam Unit Mob	LS	1	$500.00	$500.00	
	Foam Unit Rental	MO	1	$3,000.00	$3,000.00	
	Foam Labor	Day	20	$180.00	$3,600.00	
	Odor Control Foam	Drum	6	$2,000.00	$12,000.00	
	Biosolve Spray	Drums	11	$360.00	$3,960.00	
					$0.00	
4	**Excavation Shoring**	**SF**	**19440**		**$662,080.00**	
	Sheet Pile Material	SF	19440	$20.00	$388,800.00	
	Sheet Pile Installation/Removal, bracing install/removal	SF	19440	$12.00	$233,280.00	
	Pre-excavation & clearing of obstructions	LS	1	$20,000.00	$20,000.00	
	Sheetpile Design	LS	1	$20,000.00	$20,000.00	
					$0.00	
5	**Excavation Dewatering**	**WEEKS**	**4**		**$14,400.00**	
	Water Treatment System Weekly Maintenance	Week	4	$3,600.00	$14,400.00	
					$0.00	
6	**Excavation and Material Handling**	**CY**	**5340**		**$63,400.00**	
	Excavation of Surface Soils	CY	1290	$10.00	$12,900.00	
	Excavation of Subsurface Soils	CY	4050	$10.00	$40,500.00	
	Confirmation Sampling and Re-dig	LS	1	$10,000.00	$10,000.00	
7	**Backfill and Site Restoration**	**CY**	**6408**		**$128,835.75**	
	Clean Fill Material	CY	5634	$9.00	$50,706.00	
	Clean Topsoil Material	CY	774	$25.00	$19,350.00	
	Place & Compact	CY	6408	$6.00	$38,448.00	
	Compaction Testing	EA	13	$125.00	$1,612.50	
	Seed and Mulch	SF	34877	$0.25	$8,719.25	
	Misc Restoration	LS	1	10000	$10,000.00	
	SUB-TOTAL CONTRACTOR				**$1,225,775.75**	**$1,225,775.75**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$245,155.15**
	Total Subcontractor					**$1,470,930.90**
Other Contracts & Purchases						
1	**Waste Disposal**	**Ton**	**8860**		**$805,840.00**	
	Transportation and Offsite Thermal Treatment (ESMI of NY)	Ton	8540	$91.00	$777,140.00	
	Transportation and Disposal (HAZ)	Ton	50	$250.00	$12,500.00	
	Transportation and Disposal (C&D)	Ton	270	$60.00	$16,200.00	
	SUB-TOTAL OTHER CONTRACTS				**$805,840.00**	**$805,840.00**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$161,168.00**
	Total Subcontractor					**$967,008.00**
Oversight Costs						
1	**Temporary Facilities**	**MO**	**2.5**		**$7,000.00**	
	Construction Support Facilities	MO	2.5	$2,800.00	$7,000.00	
					$0.00	
2	**Air Monitoring and Health and Safety**	**Weeks**	**10**		**$100,000.00**	
	Health and Safety and Air Monitoring	Weeks	10	$10,000.00	$100,000.00	
					$0.00	
3	**Personnel**	**Man Hours**	**1438**		**$259,167.58**	
	Project Manager	HR	250	$130.00	$32,500.00	
	Construction Manager	HR	500	$85.00	$42,500.00	
	Engineer	HR	125	$85.00	$10,625.00	
	Administration (Home Office)	HR	63	$55.00	$3,465.00	
	Health and Safety Officer	HR	500	$75.00	$37,500.00	

	Travel Expenses	MO	1	$10,000.00	$10,000.00	
	Project Design (10% of Construction Cost w/o disposal fees)	LS	1	$122,577.58	$122,577.58	
	SUB-TOTAL Oversight COSTS				**$366,167.58**	**$366,167.58**
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**
	Contingency	20%				**$73,233.52**
	Total Oversight					**$439,401.09**
	GRAND TOTAL					**$2,877,339.99**

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Table 5-7
Alternative U-4 Operations, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative U-4 – Excavation of Surface Soil and Subsurface Soil Which Exceeds Unrestricted Use SCOs, Removal of Subsurface Piping, and MNA of Groundwater						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Monitoring Well Installation	EA	2	$4,500.00	$9,000.00	Install 2 monitoring wells, following upland remediation
	Monitoring & Reporting	Rounds	1	$16,440.00	$16,440.00	Occurs within 1 year following upland remediation.
	SUB-TOTAL OM&M				**$25,440.00**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$3,288.00**	
	Total OM&M				**$28,728.00**	

Unit Rate Back-Up and Notes

Year 1 Assume 8 monitoring wells to be sampled twice per year
Assume 8 samples collected from monitoring wells, 1 field duplicates, 1 MS, 1 MSD, 1 field blank and 1 trip blanks 7 samples total)

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Groundwater Monitoring (8 wells) (per sampling event)					
	Project Planning and Organizing		***Hr***			
	Project Manager (Oversight)	4	Hr	$ 120.00		$ 480.00
	Engineer (Oversight)	8	Hr	$ 90.00		$ 720.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Field Sampling Labor		***Hr***			
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Sampling Equipment, Shipping, Consumable Supplies		***Day***			
	Sample Shipping	1	Day	$ 200.00		$ 200.00
	Sampling Equipment (bailers, pumps)	1	LS	$ 100.00		$ 100.00
	Monitoring Equipment	1	LS	$ 100.00		$ 100.00
	PPE	2	Man Day	$ 25.00		$ 50.00
	Vehicle Rental	1	Day	$ 100.00		$ 100.00
	Per Diem (per person/day)	2	Man Day	$ 125.00		$ 250.00
	Miscellaneous	1	Day	$ 100.00		$ 100.00
	Sample Analysis and Data Validation		***Sample***			
	VOC analysis	8	Sample	$ 105.00		$ 840.00
	Inorganics analysis	8	Sample	$ 140.00		$ 1,120.00
	Natural attenuation parameter analysis	8	Sample	$ 300.00		$ 2,400.00
	Data Validation	8	Sample	$ 180.00		$ 1,440.00
	Data Evaluation and Reporting (Annual Report)	***60***	***Hr***			
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00
	Senior Engineer/Chemist (Oversight)	30	Hr	$ 105.00		$ 3,150.00
	Unit Rate	**Groundwater Monitoring (per event)**				**$ 16,440**

Project Name:	Penn Yan	**Revision No.:**	10
Cost Estimate No.:	S-2 - Revised 02-23-12	**Date:**	3/2/12
Client	NYSEG	**Status:**	Draft
Location	Village of Penn Yan, NY	**Author:**	CCD
		Office:	CHL
Project Element:	Sediment Remediation	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Penn Yan, NY
Project Start Date:	
Project Duration:	3.5 MO
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Document Source: _____ **Rev. Date:** _____ **Site Visit?** Yes
Document Source: _____ **Rev. Date:** _____
Document Source: _____ **Rev. Date:** _____

Cost Summary

Prime Contractor Costs	$	2,623,296
Other Contracts & Purchases	$	1,314,058
Oversight Costs	$	578,203
Project Total Estimated Cost	$	4,631,198

Notes:
1. Note intended use and audience
2. List major project assumptions
3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

5. Values and costs are for informational purposes only. Values are not true costs because they represent a combination of fixed capital and quantity-proportional components

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Table 5-8
Alternative S-2 Capital Cost
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York
Revised March 1, 2012

Alternative S-2 – Excavation/Dredging of Shallow Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR								
Prime Contractor Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$382,800*	*$76,560*	*$459,360*	*$459,360*	*18%*
2	*Site Fencing and Erosion Control*	*LF*	*1,500*	*$27,750*	*$5,550*	*$33,300*	*$22*	*1%*
3	*Odor Control Foam Consumables*	*MO*	*2*	*$23,360*	*$4,672*	*$28,032*	*$14,016*	*1%*
4	*Excavation Shoring*	*SF*	*33,820*	*$1,223,700*	*$244,740*	*$1,468,440*	*$43*	*56%*
5	*Excavation Dewatering*	*Week*	*8*	*$40,000*	*$8,000*	*$48,000*	*$6,000*	*2%*
6	*Excavation & Material Handling*	*CY*	*6,630*	*$302,500*	*$60,500*	*$363,000*	*$55*	*14%*
7	*Backfill and Site Restoration*	*CY*	*6,630*	*$185,970*	*$37,194*	*$223,164*	*$34*	*9%*
				$2,186,080	*$437,216*	*$2,623,296*		*100%*
Other Contracts & Purchases					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*12,034*	*$1,095,049*	*$219,010*	*$1,314,058*	*$109*	*100%*
				$1,095,049	*$219,010*	*$1,314,058*		*100%*
Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*3*	*$9,800*	*$1,960*	*$11,760*	*$3,920*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*12*	*$140,000*	*$28,000*	*$168,000*	*$14,000*	*24%*
3	*Personnel*	*Man Hours*	*1,969*	*$428,403*	*$85,681*	*$514,084*	*$261*	*74%*
				$578,203	*$115,641*	*$693,844*		*100%*
Grand Total						*$4,631,198*		

Add Task | Add 10 Blank Rows | Delete Row

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost	
Prime Contractor Costs	NOTE- All costs include contractor Overhead and Profit					
1	**Mobilization**	**LS**	**1**		**$382,800.00**	
	Set-Up Temporary Utilitiy Services	LS	1	$10,000.00	$10,000.00	
	Mobilize Equipment to Site	LS	1	$10,000.00	$10,000.00	
	Water Treatment System Mob & Setup	LS	1	$100,000.00	$100,000.00	
	Construct Material Staging and Water Treatment Containment Areas	LS	1	$50,000.00	$50,000.00	
	Work Plans & Submittals	HR	120	$90.00	$10,800.00	
	Sheet Pile Contractor Mobilization	LS	1	$130,000.00	$130,000.00	
	Clear & Grub	LS	1	$4,000.00	$4,000.00	
	Labor Man hrs.	Man hr	200	$65.00	$13,000.00	
	Site Survey	LS	1	$15,000.00	$15,000.00	
	Temporary Facilities	MO	3	$10,000.00	$30,000.00	
	Construction Entrance on Village of Penn Yan Property	LS	1	$10,000.00	$10,000.00	
					$0.00	
2	**Site Fencing and Erosion Control**	**LF**	**1500**		**$27,750.00**	
	Privacy Fabric	SF	15000	$0.50	$7,500.00	
	Silt Fence	LF	1500	$2.50	$3,750.00	
	Hay Bales	LF	1500	$3.00	$4,500.00	
	Temporary Fencing	LF	1500	$8.00	$12,000.00	
					$0.00	
3	**Odor Control Foam Consumables**	**MO**	**2**		**$23,360.00**	
	Foam Unit Mob	LS	1	$500.00	$500.00	
	Foam Unit Rental	MO	2.5	$3,000.00	$7,500.00	
	Foam Labor	Day	40	$180.00	$7,200.00	
	Odor Control Foam	Drum	3	$2,000.00	$6,000.00	
	Long Duration Foam	Drums	6	$360.00	$2,160.00	
					$0.00	
4	**Excavation Shoring**	**SF**	**33820**		**$1,223,700.00**	
	Sheet Pile Material	SF	33820	$20.00	$676,400.00	
	Sheet Pile Installation/Removal	SF	33820	$15.00	$507,300.00	
	Pre-excavation & clearing of obstructions	LS	1	$10,000.00	$10,000.00	
	RR Bridge Removal	LS	1	$30,000.00	$30,000.00	
5	**Excavation Dewatering**	**Week**	**8**		**$40,000.00**	
	Water Treatment System Weekly Maintenance	Week	8	$5,000.00	$40,000.00	
					$0.00	
6	**Excavation & Material Handling**	**CY**	**6630**		**$302,500.00**	
	Excavation of Impacted Soils	CY	6630	$15.00	$99,450.00	
	Moisture Control Reagents	Tons	1094	$125.00	$136,750.00	
	Mixing of Moisture Control Reagents	CY	6630	$10.00	$66,300.00	
					$0.00	
7	**Backfill and Site Restoration**	**CY**	**6630**		**$185,970.00**	
	Clean Fill Material	CY	6630	$9.00	$59,670.00	
	Place	CY	6630	$10.00	$66,300.00	
	Park Restoration	LS	1	$60,000.00	$60,000.00	
					$0.00	
	SUB-TOTAL CONTRACTOR				**$2,186,080.00**	**$2,186,080.00**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$437,216.00**
	Total Subcontractor					**$2,623,296.00**
Other Contracts & Purchases						
1	**Waste Disposal**	**Ton**	**12033.5**		**$1,095,048.50**	
	Transportation and Offsite Thermal Treatment (ESMI of NY)	Ton	12033.5	$91.00	$1,095,048.50	
	SUB-TOTAL OTHER CONTRACTS				**$1,095,048.50**	**$1,095,048.50**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$219,009.70**
	Total Subcontractor					**$1,314,058.20**

Oversight Costs						
1	**Temporary Facilities**	**MO**	**3**		**$9,800.00**	
	Construction Support Facilities	MO	3.5	$2,800.00	$9,800.00	
					$0.00	
2	**Air Monitoring and Health and Safety**	**Weeks**	**12**		**$140,000.00**	
	Health & Safety & Air monitoring	Weeks	14	$10,000.00	$140,000.00	
					$0.00	
3	**Personnel**	**Man Hours**	**1969**		**$428,403.00**	
	Project Manager	HR	350	$130.00	$45,500.00	
	Construction Manager	HR	700	$85.00	$59,500.00	
	Engineer	HR	175	$85.00	$14,875.00	
	Health and Safety Officer	HR	700	$75.00	$52,500.00	
	Administration (Home Office)	HR	44	$55.00	$2,420.00	
	Travel Expenses	MO	3.5	$10,000.00	$35,000.00	
	Project Design (10% of construction costs - does not include disposal)	LS	1	$218,608.00	$218,608.00	
					$0.00	
	SUB-TOTAL Oversight COSTS				**$578,203.00**	**$578,203.00**
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**
	Contingency	20%				**$115,640.60**
	Total Oversight					**$693,843.60**
	GRAND TOTAL					**$4,631,197.80**

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Table 5-9
Alternative S-2 Operations, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative S-2 – Excavation/Dredging of Surface Sediment and Visually Impacted Sediment, Placement of Backfill, and MNR						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Sediment Sampling	Event	3	$32,230.00	$81,251.97	Computed using PV for sampling events occuring at years 1,2,and 5 (3 events total)
	Monitoring & Reporting	Yr.	30	$3,210.00	$39,833.02	Computed using PV for annual reports, year 1 through 30.
	SUB-TOTAL OM&M				**$121,084.99**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$24,217.00**	
	Total OM&M				**$145,301.99**	

Unit Rate Back-Up and Notes

Sediment Sampling (per Event)

Assume 20 sediment samples collected per event

Assume 20 sediment samples collected per event, 1 field duplicates, 1 MS, 1 MSD, 1 field blank and 1 trip blanks 7 samples total)

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Sediment Sampling (20 each) (per sampling event)					
	Project Planning and Organizing		***Hr***			
	Project Manager (Oversight)	4	Hr	$ 120.00		$ 480.00
	Engineer (Oversight)	8	Hr	$ 90.00		$ 720.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Field Sampling Labor		***Hr***			
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Sampling Equipment, Shipping, Consumable Supplies		***Day***			
	Sample Shipping	1	Day	$ 200.00		$ 200.00
	Sampling Equipment	1	LS	$ 100.00		$ 100.00
	Monitoring Equipment	1	LS	$ 100.00		$ 100.00
	PPE	3	Man Day	$ 25.00		$ 75.00
	Boat Rental	1	Day	$ 200.00		$ 200.00
	Vehicle Rental	1	Day	$ 100.00		$ 100.00
	Per Diem (per person/day)	3	Man Day	$ 125.00		$ 375.00
	Miscellaneous	1	Day	$ 100.00		$ 100.00
	Sample Analysis and Data Validation		***Sample***			
	VOC analysis	20	Sample	$ 105.00		$ 2,100.00
	SVOCs	20	Sample	$ 190.00		$ 3,800.00
	Inorganics analysis	20	Sample	$ 140.00		$ 2,800.00
	Natural attenuation parameter analysis	20	Sample	$ 300.00		$ 6,000.00
	Data Validation	20	Sample	$ 180.00		$ 3,600.00
	Data Evaluation and Reporting (Annual Report)	***80***	***Hr***			
	Senior Engineer/Chemist (Oversight)	40	Hr	$ 105.00		$ 4,200.00
	Senior Engineer/Chemist (Oversight)	40	Hr	$ 105.00		$ 4,200.00
	Unit Rate	**Groundwater Monitoring (per event)**				**$ 32,230**

Annual Reports

Reference	Description	Qty.	Unit	Base Rate	djusted Ra	Costs
	Project Planning and Organizing		***Hr***			
	Project Manager	8	Hr	$ 120.00		$ 960.00
	Engineer	24	Hr	$ 90.00		$ 2,160.00
	Admin	2	Hr.	$ 45.00		$ 90.00
	Unit Rate	**Groundwater Monitoring (per event)**				**$ 3,210**

Project Name:	Penn Yan	**Revision No.:**	2
Cost Estimate No.:	S-3	**Date:**	5/14/10
Client	NYSEG	**Status:**	Draft
Location	Village of Penn Yan, NY	**Author:**	CCD
		Office:	WES
Project Element:	Sediment Remediation	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Penn Yan, NY
Project Start Date:	
Project Duration:	2.5 MO
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Document Source: _____ **Rev. Date:** _____ **Site Visit?** Yes
Document Source: _____ **Rev. Date:** _____
Document Source: _____ **Rev. Date:** _____

Cost Summary

Prime Contractor Costs	**$**	**2,438,310**
Other Contracts & Purchases	**$**	**503,412**
Oversight Costs	**$**	**413,668**
Project Total Estimated Cost	**$**	**3,438,123**

Notes:
1. Note intended use and audience
2. List major project assumptions
3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

5. Values and costs are for informational purposes only. Values are not true costs because they represent a combination of fixed capital and quantity-proportional components

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Table 5-10
Alternative S-3 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative S-3 – Excavation/Dredging of Surface Sediment and Subaqueous Capping							
Prime Contractor Costs				20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$372,800*	*$74,560*	*$447,360*	*$447,360*	*18%*
2	*Site Fencing and Erosion Control*	*LF*	*1,500*	*$27,750*	*$5,550*	*$33,300*	*$22*	*1%*
3	*Odor Control Foam Consumables*	*MO*	*1*	*$14,000*	*$2,800*	*$16,800*	*$16,800*	*1%*
4	*Excavation Shoring*	*SF*	*33,820*	*$1,223,700*	*$244,740*	*$1,468,440*	*$43*	*60%*
5	*Excavation Dewatering*	*Week*	*4*	*$20,000*	*$4,000*	*$24,000*	*$6,000*	*1%*
6	*Excavation & Material Handling*	*CY*	*2,540*	*$116,000*	*$23,200*	*$139,200*	*$55*	*6%*
7	*Backfill, Cap, and Site Restoration*	*CY*	*2,540*	*$257,675*	*$51,535*	*$309,210*	*$122*	*13%*
				$2,031,925	*$406,385*	*$2,438,310*		*100%*
Other Contracts & Purchases					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*Ton*	*4,610*	*$419,510*	*$83,902*	*$503,412*	*$109*	*100%*
				$419,510	*$83,902*	*$503,412*		*100%*
Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*2*	*$5,600*	*$1,120*	*$6,720*	*$3,360*	*1%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*8*	*$80,000*	*$16,000*	*$96,000*	*$12,000*	*19%*
3	*Personnel*	*Man Hours*	*1,125*	*$328,068*	*$65,614*	*$393,681*	*$350*	*79%*
				$413,668	*$82,734*	*$496,401*		*100%*
Grand Total						*$3,438,123*		

Penn Yan
S-3
NYSEG
Village of Penn Yan, NY

Sediment Remediation

Add Task | Add 10 Blank Rows | By: | Delete Row | Rev Date: 5/14/10

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost	
Prime Contractor Costs	NOTE- All costs include contractor Overhead and Profit					
1	**Mobilization**	**LS**	**1**		**$372,800.00**	
	Set-Up Temporary Utilitiy Services	LS	1	$10,000.00	$10,000.00	
	Mobilize Equipment to Site	LS	1	$10,000.00	$10,000.00	
	Water Treatment System Mob & Setup	LS	1	$100,000.00	$100,000.00	
	Construct Material Staging and Water Treatment Containment Areas	LS	1	$50,000.00	$50,000.00	
	Work Plans & Submittals	HR	120	$90.00	$10,800.00	
	Sheet Pile Contractor Mobilization	LS	1	$130,000.00	$130,000.00	
	Clear & Grub	LS	1	$4,000.00	$4,000.00	
	Labor Man hrs.	Man hr	200	$65.00	$13,000.00	
	Site Survey	LS	1	$15,000.00	$15,000.00	
	Temporary Facilities	MO	2	$10,000.00	$20,000.00	
	Construction Entrance on Village of Penn Yan Property	LS	1	$10,000.00	$10,000.00	
2	**Site Fencing and Erosion Control**	**LF**	**1500**		**$27,750.00**	
	Privacy Fabric	SF	15000	$0.50	$7,500.00	
	Silt Fence	LF	1500	$2.50	$3,750.00	
	Hay Bales	LF	1500	$3.00	$4,500.00	
	Temporary Fencing	LF	1500	$8.00	$12,000.00	
					$0.00	
3	**Odor Control Foam Consumables**	**MO**	**1**		**$14,000.00**	
	Foam Unit Mob	LS	1	$500.00	$500.00	
	Foam Unit Rental	MO	1	$3,000.00	$3,000.00	
	Foam Labor	Day	15	$180.00	$2,700.00	
	Odor Control Foam	Drums	3	$2,000.00	$6,000.00	
	Long Duration Foam	Drums	5	$360.00	$1,800.00	
					$0.00	
4	**Excavation Shoring**	**SF**	**33820**		**$1,223,700.00**	
	Sheet Pile Material	SF	33820	$20.00	$676,400.00	
	Sheet Pile Installation/Removal, bracing install/removal	SF	33820	$15.00	$507,300.00	
	Pre-excavation & clearing of obstructions	LS	1	$10,000.00	$10,000.00	
	RR Bridge Removal	LS	1	$30,000.00	$30,000.00	
5	**Excavation Dewatering**	**Week**	**4**		**$20,000.00**	
	Water Treatment System Weekly Maintenance	Week	4	$5,000.00	$20,000.00	
					$0.00	
6	**Excavation & Material Handling**	**CY**	**2540**		**$116,000.00**	
	Excavation of Impacted Soils	CY	2540	$15.00	$38,100.00	
	Moisture Control Reagents	Tons	420	$125.00	$52,500.00	
	Mixing of Moisture Control Reagents	CY	2540	$10.00	$25,400.00	
					$0.00	
7	**Backfill, Cap, and Site Restoration**	**CY**	**2540**		**$257,675.00**	
	Clean Fill Material	CY	2295	$9.00	$20,655.00	
	Aquablock	CY	245	$390.00	$95,550.00	
	Place Fill	CY	245	$10.00	$2,450.00	
	Place Aquablock	SF	13170	$6.00	$79,020.00	
	Park Restoration	LS	1	$60,000.00	$60,000.00	
	SUB-TOTAL CONTRACTOR				**$2,031,925.00**	**$2,031,925.00**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$406,385.00**
	Total Subcontractor					**$2,438,310.00**
Other Contracts & Purchases						
1	**Waste Disposal**	**Ton**	**4610**		**$419,510.00**	
	Transportation and Offsite Thermal Treatment (ESMI of NY)	Ton	4610	$91.00	$419,510.00	
					$0.00	
	SUB-TOTAL OTHER CONTRACTS				**$419,510.00**	**$419,510.00**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$83,902.00**
	Total Subcontractor					**$503,412.00**
RETEC Costs						
1	**Temporary Facilities**	**MO**	**2**		**$5,600.00**	
	Construction Support Facilities	MO	2	$2,800.00	$5,600.00	
					$0.00	
2	**Air Monitoring and Health and Safety**	**Weeks**	**8**		**$80,000.00**	
	Health & Safety & Air monitoring	Weeks	8	$10,000.00	$80,000.00	
					$0.00	
3	**Personnel**	**Man Hours**	**1125**		**$328,067.50**	
	Project Manager	HR	200	$130.00	$26,000.00	
	Construction Manager	HR	400	$85.00	$34,000.00	
	Engineer	HR	100	$85.00	$8,500.00	
	Health and Safety Officer	HR	400	$75.00	$30,000.00	
	Administration (Home Office)	HR	25	$55.00	$1,375.00	

	Travel Expenses	MO	2.5	$10,000.00	$25,000.00	
	Project Design (10% of construction costs - does not include disposal)	LS	1	$203,192.50	$203,192.50	
					$0.00	
	SUB-TOTAL Oversight COSTS				**$413,667.50**	**$413,667.50**
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**
	Contingency	20%				**$82,733.50**
	Total Oversight					**$496,401.00**
	GRAND TOTAL					**$3,438,123.00**

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Table 5-11
Alternative S-3 Operation, Monitoring and Maintenance Costs
NYSEG - Penn Yan Former MGP Site - Penn Yann, New York

Alternative S-3 – Excavation/Dredging of Surface Sediment and Subaqueous Capping						
Task/Sub Task	**Description**	**Unit**	**Qty**	**Rate**	**Total Cost (PV)**	**Estimate/Source Notes**
	Sediment Sampling	Event	3	$32,230.00	$81,251.97	Computed using PV for sampling events occuring at years 1,2,and 5 (3 events total)
	Yearly Cap Inspection (years 1-5)	Event	5	$3,940.00	$16,154.78	
	Monitoring & Reporting	Yr.	30	$3,210.00	$39,833.02	Computed using PV for annual reports, year 1 through 30.
	SUB-TOTAL OM&M				**$137,239.77**	
	Mark-up	0%			**$0.00**	
	Contingency	20%			**$27,447.95**	
	Total OM&M				**$164,687.72**	

Unit Rate Back-Up and Notes

Sediment Sampling (per Event)

Assume 20 sediment samples collected per event

Assume 20 sediment samples collected per event, 1 field duplicates, 1 MS, 1 MSD, 1 field blank and 1 trip blanks 7 samples total)

Reference	Description	Qty.	Unit	Base Rate	Adjusted Rate	Costs
	Sediment Sampling (20 each) (per sampling event)					
	Project Planning and Organizing		***Hr***			
	Project Manager (Oversight)	4	Hr	$ 120.00		$ 480.00
	Engineer (Oversight)	8	Hr	$ 90.00		$ 720.00
	Technician (Oversight)	8	Hr	$ 70.00		$ 560.00
	Field Sampling Labor		***Hr***			
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Technician (Oversight)	12	Hr	$ 70.00		$ 840.00
	Sampling Equipment, Shipping, Consumable Supplies		***Day***			
	Sample Shipping	1	Day	$ 200.00		$ 200.00
	Sampling Equipment	1	LS	$ 100.00		$ 100.00
	Monitoring Equipment	1	LS	$ 100.00		$ 100.00
	PPE	3	Man Day	$ 25.00		$ 75.00
	Boat Rental	1	Day	$ 200.00		$ 200.00
	Vehicle Rental	1	Day	$ 100.00		$ 100.00
	Per Diem (per person/day)	3	Man Day	$ 125.00		$ 375.00
	Miscellaneous	1	Day	$ 100.00		$ 100.00
	Sample Analysis and Data Validation		***Sample***			
	VOC analysis	20	Sample	$ 105.00		$ 2,100.00
	SVOCs	20	Sample	$ 190.00		$ 3,800.00
	Inorganics analysis	20	Sample	$ 140.00		$ 2,800.00
	Natural attenuation parameter analysis	20	Sample	$ 300.00		$ 6,000.00
	Data Validation	20	Sample	$ 180.00		$ 3,600.00
	Data Evaluation and Reporting (Annual Report)	***80***	***Hr***			
	Senior Engineer/Chemist (Oversight)	40	Hr	$ 105.00		$ 4,200.00
	Senior Engineer/Chemist (Oversight)	40	Hr	$ 105.00		$ 4,200.00
			Unit Rate	**Groundwater Monitoring (per event)**		**$ 32,230**

Cap Inspection

Reference	Description	Qty.	Unit	Base Rate	Adjusted Rate	Costs
	Project Planning and Organizing		***Hr***			
	Project Manager	8	Hr	$ 120.00		$ 960.00
	Engineer (2 @ 1 day each onsite & 2 days for report)	32	Hr	$ 90.00		$ 2,880.00
	Vehicle Rental	1	Day	$ 100.00		$ 100.00
			Unit Rate	**Groundwater Monitoring (per event)**		**$ 3,940**

Annual Reports

Reference	Description	Qty.	Unit	Base Rate	Adjusted Rate	Costs
	Project Planning and Organizing		***Hr***			
	Project Manager	8	Hr	$ 120.00		$ 960.00
	Engineer	24	Hr	$ 90.00		$ 2,160.00
	Admin	2	Hr.	$ 45.00		$ 90.00
			Unit Rate	**Groundwater Monitoring (per event)**		**$ 3,210**

Project Name:	Penn Yan	**Revision No.:**	7
Cost Estimate No.:	S-4	**Date:**	6/30/10
Client	NYSEG	**Status:**	Draft
Location	Village of Penn Yan, NY	**Author:**	CCD
		Office:	WES
Project Element:	Sediment Remediation	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	Penn Yan, NY
Project Start Date:	
Project Duration:	5
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Document Source: _____ **Rev. Date:** _____ **Site Visit?** Yes
Document Source: _____ **Rev. Date:** _____
Document Source: _____ **Rev. Date:** _____

Cost Summary

Prime Contractor Costs	**$**	**3,170,052**
Other Contracts & Purchases	**$**	**1,427,244**
Oversight Costs	**$**	**585,121**
Project Total Estimated Cost	**$**	**5,299,441**

Notes:

1. Note intended use and audience

2. List major project assumptions

3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

5. Values and costs are for informational purposes only. Values are not true costs because they represent a combination of fixed capital and quantity-proportional components

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Table 5-12
Alternative S-4 Capital Costs
NYSEG - Penn Yan Former MGP Site - Penn Yan, New York

Alternative S-4 – Full Excavation/Dredging of Impacted Sediment and Placement of Backfill

Prime Contractor Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$391,800*	*$78,360*	*$470,160*	*$470,160*	*15%*
2	*Pre-Design Investigation*	*LS*	*1*	*$300,000*	*$60,000*	*$360,000*	*$360,000*	*11%*
3	*Site Fencing and Erosion Control*	*LF*	*1,500*	*$27,750*	*$5,550*	*$33,300*	*$22*	*1%*
4	*Odor Control Foam Consumables*	*MO*	*3*	*$40,560*	*$8,112*	*$48,672*	*$19,469*	*2%*
5	*Excavation Shoring*	*SF*	*33,820*	*$1,218,700*	*$243,740*	*$1,462,440*	*$43*	*46%*
6	*Excavation Dewatering*	*Week*	*8*	*$57,600*	*$11,520*	*$69,120*	*$8,640*	*2%*
7	*Excavation & Material Handling*	*CY*	*7,200*	*$328,500*	*$65,700*	*$394,200*	*$55*	*12%*
8	*Backfill and Site Restoration*	*LS*	*1*	*$276,800*	*$55,360*	*$332,160*	*$332,160*	*10%*
				$2,641,710	*$528,342*	*$3,170,052*		*100%*
Other Contracts & Purchases					**20%**			
Task ID	***Task Descr.***	***Unit***	***Quantity***	***Bare Cost***	***Contingency***	***Total Cost***	***Unit Rate***	***%***
1	*Waste Disposal*	*Ton*	*13,070*	*$1,189,370*	*$237,874*	*$1,427,244*	*$109*	*100%*
				$1,189,370	*$237,874*	*$1,427,244*		*100%*
Oversight Costs					**20%**			
Task ID	***Task Descr.***	***Unit***	***Quantity***	***Bare Cost***	***Contingency***	***Total Cost***	***Unit Rate***	***%***
1	*Temporary Facilities*	*MO*	*4*	*$11,200*	*$2,240*	*$13,440*	*$3,360*	*2%*
2	*Air Monitoring and Health and Safety*	*Weeks*	*12*	*$60,000*	*$12,000*	*$72,000*	*$6,000*	*10%*
3	*Personnel*	*Man Hours*	*2,250*	*$513,921*	*$102,784*	*$616,705*	*$274*	*88%*
				$585,121	*$117,024*	*$702,145*		*100%*
Grand Total						*$5,299,441*		

Penn Yan
S-4
NYSEG
Village of Penn Yan, NY

Sediment Remediation

Add Task | Add 10 Blank Rows | By: | Delete Row | Rev Date: 6/30/10

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost	
Prime Contractor Costs	NOTE- All costs include contractor Overhead and Profit					
1	**Mobilization**	**LS**	**1**		**$391,800.00**	
	Set-Up Temporary Utilitiy Services	LS	1	$10,000.00	$10,000.00	
	Mobilize Equipment to Site	LS	1	$10,000.00	$10,000.00	
	Water Treatment System Mob & Setup	LS	1	$100,000.00	$100,000.00	
	Construct Material Staging and Water Treatment Containment Areas	LS	1	$50,000.00	$50,000.00	
	Work Plans & Submittals	HR	120	$90.00	$10,800.00	
	Sheet Pile Contractor Mobilization	LS	1	$130,000.00	$130,000.00	
	Clear & Grub	LS	1	$4,000.00	$4,000.00	
	Labor Man hrs.	Man hr	300	$65.00	$19,500.00	
	Site Survey	LS	1	$7,500.00	$7,500.00	
	Temporary Facilities	MO	4	$10,000.00	$40,000.00	
	Construction Access to Village of Penn Yan Property	LS	1	$10,000.00	$10,000.00	
					$0.00	
2	**Pre-Design Investigation**	**LS**	**1**		**$300,000.00**	
	Pre-design investigation to determine cleanup criteria	LS	1	$200,000.00	$200,000.00	
	Pre-design investigation for forensics and backgroun	LS	1	$100,000.00	$100,000.00	
3	**Site Fencing and Erosion Control**	**LF**	**1500**		**$27,750.00**	
	Privacy Fabric	SF	15000	$0.50	$7,500.00	
	Silt Fence	LF	1500	$2.50	$3,750.00	
	Hay Bales	LF	1500	$3.00	$4,500.00	
	Temporary Fencing	LF	1500	$8.00	$12,000.00	
					$0.00	
4	**Odor Control Foam Consumables**	**MO**	**2.5**		**$40,560.00**	
	Foam Unit Mob	LS	1	$500.00	$500.00	
	Foam Unit Rental	MO	2.5	$3,000.00	$7,500.00	
	Foam Labor	Day	60	$180.00	$10,800.00	
	Odor Control Foam	Drum	8	$2,000.00	$16,000.00	
	Long Duration Foam	Drums	16	$360.00	$5,760.00	
					$0.00	
5	**Excavation Shoring**	**SF**	**33820**		**$1,218,700.00**	
	Sheet Pile Material	SF	33820	$20.00	$676,400.00	
	Sheet Pile Installation/Removal, bracing install/removal	SF	33820	$15.00	$507,300.00	
	Pre-excavation & clearing of obstructions	LS	1	$10,000.00	$10,000.00	
	Remove Portion of RR Bridge for Sheet Pile install	LS	1	$25,000.00	$25,000.00	
6	**Excavation Dewatering**	**Week**	**8**		**$57,600.00**	
	Water Treatment System Weekly Maintenance	Week	8	$7,200.00	$57,600.00	
					$0.00	
7	**Excavation & Material Handling**	**CY**	**7200**		**$328,500.00**	
	Excavation of Impacted Soils	CY	7200	$15.00	$108,000.00	
	Moisture Control Reagents	Tons	1188	$125.00	$148,500.00	
	Mixing of Moisture Control Reagents	CY	7200	$10.00	$72,000.00	
					$0.00	
8	**Backfill and Site Restoration**	**LS**	**1**		**$276,800.00**	
	Furnish, Place, and Compact Backfill to preexisting bathimetry	CY	7200	$19.00	$136,800.00	
	Restoration of Park	LS	1	$100,000.00	$100,000.00	
	Repair/Replace Portion of RR Bridge	LS	1	$40,000.00	$40,000.00	
					$0.00	
	SUB-TOTAL CONTRACTOR				**$2,641,710.00**	**$2,641,710.00**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$528,342.00**
	Total Subcontractor					**$3,170,052.00**
Other Contracts & Purchases						
1	**Waste Disposal**	**Ton**	**13070**		**$1,189,370.00**	
	Transportation and Offsite Thermal Treatment (ESMI of NY)	Ton	13070	$91.00	$1,189,370.00	
					$0.00	
	SUB-TOTAL OTHER CONTRACTS				**$1,189,370.00**	**$1,189,370.00**
	Mark-up	0%				**$0.00**
	Contingency	20%				**$237,874.00**
	Total Subcontractor					**$1,427,244.00**
RETEC Costs						
1	**Temporary Facilities**	**MO**	**4**		**$11,200.00**	
	Construction Support Facilities	MO	4	$2,800.00	$11,200.00	
					$0.00	
2	**Air Monitoring and Health and Safety**	**Weeks**	**12**		**$60,000.00**	
	Health & Safety & Air monitoring	Weeks	12	$5,000.00	$60,000.00	
					$0.00	
3	**Personnel**	**Man Hours**	**2250**		**$513,921.00**	
	Project Manager	HR	400	$130.00	$52,000.00	
	Construction Manager	HR	800	$85.00	$68,000.00	
	Engineer	HR	200	$85.00	$17,000.00	

	Health and Safety Officer	HR	800	$75.00	$60,000.00	
	Administration (Home Office)	HR	50	$55.00	$2,750.00	
	Travel Expenses	MO	5	$10,000.00	$50,000.00	
	Project Design (10% of construction costs - does not include disposal)	LS	1	$264,171.00	$264,171.00	
					$0.00	
	SUB-TOTAL Oversight COSTS				**$585,121.00**	**$585,121.00**
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**
	Contingency	20%				**$117,024.20**
	Total Oversight					**$702,145.20**
	GRAND TOTAL					**$5,299,441.20**