# FEASIBILITY STUDY REPORT

Albion Former Manufactured Gas Plant Site
Site No: 8-37-012
Orleans County
Albion, New York

*Prepared for:*
**National Grid, Syracuse, New York**

*Submitted by:*
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AMEC Geomatrix

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ARARs | Applicable or Relevant and Appropriate Requirements |
| ACO | Administrative Consent Order |
| BGS | Below Ground Surface |
| BTEX | Benzene, Toluene, Ethylbenzene, Xylenes |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| COCs | Constituents of Concern |
| COPCs | Constituents of Potential Concern |
| CLM/ALM | Cinder-Like Material and Ash-Like Material |
| DER | Division of Environmental Remediation |
| GRAs | General Response Actions |
| HHRA | Human Health Exposure Assessment |
| MGP | Manufactured Gas Plant |
| MNA | Monitored Natural Attenuation |
| NAPL | Non-Aqueous Phase Liquid |
| NCP | National Contingency Plan |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| NYSDOT | New York State Department of Transportation |
| O&M | Operation and Maintenance |
| OM&M | Operation, Monitoring, and Maintenance |
| PAHs | Polycyclic Aromatic Hydrocarbons |
| PRAP | Proposed Remedial Action Plan |
| RAOs | Remedial Action Objectives |
| SCGs | Standards, Criteria, and Guidance |
| SCOs | Soil Cleanup Objectives |
| SMP | Site Soils and Groundwater Management Plan or Site Management Plan |
| TAGM | Technical Administrative Guidance Memorandum |
| TOGS | Technical and Operational Guidance Series |
| USEPA | United States Environmental Protection Agency |

# FEASIBILITY STUDY REPORT
Albion Former MGP Site
Site No: 8-37-012
Orleans County, Albion, New York

## EXECUTIVE SUMMARY

### BACKGROUND

AMEC Geomatrix, Inc. (AMEC) prepared this Feasibility Study (FS) Report on behalf of National Grid for the Albion Former Manufactured Gas Plant (MGP) Site located in Albion, New York. The FS was conducted pursuant to a multi-site Consent Order executed with the New York State Department of Environmental Conservation (NYSDEC). The results of this FS will be used by the NYSDEC to select a remedial alternative for the site.

The 0.25 acre site borders property that serves the New York State Barge Canal system. The property includes a lift bridge on Ingersoll Street that crosses the canal north of the site. The Ingersoll Street Lift Bridge was partially reconstructed in 2007 by the New York State Department of Transportation (NYSDOT). Contractors utilized the Albion Former MGP Site for equipment staging during bridge reconstruction activities. Following bridge reconstruction, the NYSDOT restored the surface of the Site by placing a layer of topsoil (graded and seeded) over the grass areas of the Site and additional crushed stone on the access drive to the adjacent substation.

### SITE GEOLOGY AND HYDROGEOLOGY

Historic fill covers the site and extends onto adjacent properties. The fill material appears to have been used as grading material for historic commercial and industrial buildings that occupied the south side of the Barge Canal in the Albion Business District during the late 1800's and early 1900's. The fill material generally consists of silt, sand and fine gravel and contains glass, coal fragments and cinder-like material and ash-like material (CLM/ALM) present at a depth of about 3 to 5 feet below grade. Low permeability dense till composed of clayey silt with various mixtures of sand and gravel is present beneath the fill. Bedrock underlies the glacial till at a depth of approximately 15 to 20 feet below ground surface (bgs).

Groundwater elevations in the vicinity of the site are influenced by seasonal NYS Barge Canal operating water levels. Groundwater flows from the site in a southeasterly direction during canal operation and northeasterly direction during non-canal operations toward the sanitary sewers located along Ingersoll and East Bank Streets. A convergent area of groundwater flow paralleling Ingersoll Street occurs east of the site. The lower head along the axis of

convergent flow is caused by drainage to permeable sewer bedding and a constant low head maintained by active pumping in the bridge structure lift pit. The convergent area of groundwater flow poses a barrier to the eastward flow of groundwater.

## NATURE AND EXTENT OF IMPACTS

Investigations conducted at the Site identified constituents of potential concern (COPCs) namely benzene, toluene, ethylbenzene, and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs) in site media. Impacts in site media are summarized below.

**Surface and Shallow Soil:** PAHs were detected in surface and shallow soils (upper 6 feet) at concentrations above Part 375 Restricted Use SCOs during remedial investigations. The PAHs are associated with the historic fill materials used to grade the area adjacent to the canal during the late 1800s and early 1900s. Currently, turf, topsoil, and crushed stone (placed following NYSDOT site restoration) covers ground surface across the site. Placement of this material occurred after remedial investigations were completed.

**Subsurface Soil:** BTEX and total cyanide were not detected in subsurface soil (soil deeper than 6 feet) above Part 375 Restricted Use SCOs. Several PAHs, typically related to MGP operations (i.e., naphthalene, methylnaphthalene, acenaphthene, acenaphthylene, anthracene), were detected in on-site subsurface soil. Higher concentrations of PAHs were detected in the subsurface in the area of the western gas holder and MGP-derived residual material (coal tar) was encountered at one location on-site (MW-8). As demonstrated during subsequent inspections, including a recent assessment conducted in September 2009, the coal tar was characterized as immobile and is limited to a localized area near the well at a depth of 15 feet below grade.

**Subsurface Structures:** The investigations concluded that organic MGP-derived chemicals had not impacted the lift pit at the Ingersoll Street Lift Bridge and MGP residual material had not entered the brick-line sanitary sewer manholes.

**Groundwater:** Dissolved phase MGP-related constituents (i.e., BTEX, naphthalene, and total cyanide) were detected at concentrations above groundwater standards in overburden groundwater at two locations on-site: monitoring well MW-5 and MW-8. Samples collected from the remaining 8 monitoring wells located on-site and off-site did not exhibit MGP impact. Monitoring well MW-5 is downgradient of MGP-impacted soils identified in the vicinity of the former western gas holder. Monitoring well MW-8 is located in an area where coal tar residual material was present.

**Soil Vapor:** Volatile organic compounds (VOCs) in on-site soil and groundwater have the potential to volatilize and migrate upward as a vapor phase into the vadose zone. However, no occupied structures exist on-site. A commercial business (currently a hair salon) is located

immediately adjacent to the southern site boundary. MGP-related VOCs have not been detected in wells located at the southern downgradient site boundary (MW-6) or off-site (MW-7, MW-9 and MW-10) in the direction of groundwater flow. The relevancy of soil vapor migration may need to be investigated in the future if land use on-site or adjacent to the site changes (i.e., future development).

## HUMAN HEALTH EXPOSURE ASSESSMENT

The Human Health Exposure Assessment (HHEA) identified constituents of potential concern (COPCs) as: BTEX and PAHs in on-site soil and groundwater. A completed human health exposure pathway was not identified in connection with subsurface soils or groundwater under current site conditions. There is, however, potential exposure to MGP-related constituents via inhalation of vapors, direct contact, and accidental ingestion of subsurface soil and groundwater under a potential future scenario where an on-site construction and/or utility worker would be involved with subsurface excavation.

## REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) were developed in the FS for impacted media identified at the site which are protective of human health and the environment.

The RAOs for the site are to eliminate or reduce, to the extent practicable:

- Ingestion of MGP-related COCs in soil and groundwater
- Contact with or inhalation of MGP-related COCs in soil and groundwater
- The source of MGP-related impacts which affect groundwater quality

The RAOs above are consistent with media specific remedial action objectives identified in remedy selection methods presented in NYSDEC Remedial Program regulations.

## DEVELOPMENT OF REMEDIAL ALTERNATIVES

In consideration of technological, site, medium, and contaminant-specific factors, remedial alternatives for soil and groundwater were developed to address RAOs. The alternatives are identified and described below.

## SOIL REMEDIAL ALTERNATIVES

**Alternative S-1 – No Further Action:** Under the no further action alternative, no remedial activities beyond the RI/FS would be conducted at the site.

**Alternative S-2 – Institutional Controls:** This alternative would implement institutional controls to provide special protocols for any excavation and soil use at the site. A Site Management Plan (SMP) would be prepared and formalized in an environmental easement for the site property and would include procedures for handling residual contaminated soils that

may be excavated from the site during future redevelopment or become exposed after demolition and removal of existing structures including underground structures.

**Alternative S-3 – Limited Surface/Shallow Soil Removal and Installation of Soil Cover:** This alternative involves removing the upper two feet of soil (approximately 500 cubic yards), laying geotextile as a demarcation barrier (as a marker to support elements of the Site Management Plan), and placing two feet of clean soil and crushed stone (over existing substation access) across the site to serve as a soil cover. The clean soil would be properly graded to maintain current surface water drainage patterns, and seeded. This alternative removes CLM/ALM from shallow soil and the greater thickness of barrier materials would further minimize direct contact with shallow soils. This alternative also requires an SMP. In addition to the SMP contents listed above for Alternative S-2, the SMP specified for Alternative S-3 will include a Cover Maintenance Plan which would also be formalized in the environmental easement.

**Alternative S-4 – Remove Soil Above 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives:** This alternative involves the excavation and removal of soil containing COCs above Part 375 Unrestricted Use SCOs. Under this alternative, the historic fill material (upper 8 to 10 feet of soil/fill) would be removed and deeper soils containing constituents above Part 375 Unrestricted Use SCOs would also be removed (approximately 2,200 cubic yards). This alternative is presented as a NYSDEC requirement and is not considered a reasonable alternative given the current and future site use, site size restriction for large scale construction, and the significant disruption to the community that would result through alternative implementation.

## GROUNDWATER REMEDIAL ALTERNATIVES

**Alternative GW-1 – No Further Action:** Under this alternative, no active remedial activities would be conducted.

**Alternative GW-2 – Institutional Controls:** This alternative would require the implementation of institutional controls in the form of governmental, proprietary, enforcement, or permit controls to restrict groundwater usage.

**Alternative GW-3 – Monitored Natural Attenuation:** Naturally occurring chemical, biological, and/or physical processes that degrade MGP related COCs in groundwater would be monitored under this alternative and would include institutional controls as described above for Alternative GW-2 would also be included in Alternative GW-3.

**Alternative GW-4 – Enhanced Monitored Natural Attenuation:** This alternative would utilize oxygen-releasing compounds (ORC) and/or other amendments to further enhance natural biological processes that degrade dissolved phase MGP related constituents in on-site groundwater. It would also include a natural attenuation monitoring program. Institutional controls as described above for Alternative GW-2 would also be included in Alternative GW-4.

## COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Following the comparative analysis of the remedial alternatives, the selected remedial components for soil and ground water consist of the following:

### Recommended Soil Remedial Alternative

The RI showed that COCs present in soils at the site have not resulted in off-site impacts to groundwater. Therefore, it is unlikely these soils represent a continuing source of potential

off-site groundwater impacts. The environmental benefit associated with deeper site excavations is therefore marginal. Alternative S-3 is therefore recommended as the preferred alternative.

## Recommended Groundwater Remedial Alternative

Alternatives GW-1 and GW-2 cannot be considered fully protective of human health and the environment. Alternatives GW-3 and GW-4 meet project RAOs and would protect human health and the environment from exposure to impacted groundwater. Alternative GW-3 is therefore recommended as the preferred alternative.

## Recommended Remedial Alternative Cost

The estimated present worth cost of the recommended remedial alternatives for soil and groundwater is:

| Recommended Remedial Alternative | Estimated Capital Cost | Estimated OM&M Present Worth | Total Estimated Cost |
|---|---|---|---|
| **S-3 - Limited Surface/Shallow Soil Removal and Soil Cover Installation** | $379,000 | $96,000 | **$475,000** |
| **GW-3 - Monitored Natural Attenuation** | $53,000 | $197,000 | **$250,000** |
| **Total Estimated PW Cost** | | | **$725,000** |

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# FEASIBILITY STUDY REPORT
Albion Former MGP Site
Site No: 8-37-012
Orleans County, Albion, New York

## 1.0 INTRODUCTION

### 1.1 GENERAL

This Feasibility Study (FS) Report has been prepared by AMEC Geomatrix, Inc. (AMEC) on behalf of National Grid for the Albion Former Manufactured Gas Plant (MGP) Site (Site No: 8-37-012) located in Albion, New York (Figure 1). The FS was conducted pursuant to a multi-site Consent Order (Index No. A4-0473-0000, effective November 2003) executed with the New York State Department of Environmental Conservation (NYSDEC). This FS report has been prepared consistent with applicable guidance pursuant to the following:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, the National Contingency Plan (NCP), and the United States Environmental Protection Agency (USEPA)
- NYSDEC Technical and Administrative Guidance Memorandum (TAGM #4030)
- Selection of Remedial Actions at Inactive Hazardous Waste Sites and Draft DER-10
- Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002)
- Environmental Remediation Programs, NYSDEC Division of Environmental Remediation (DER), 6NYCRR Part 375

### 1.2 PURPOSE AND REPORT ORGANIZATION

The results of this FS will be used by the NYSDEC to select a final remedial alternative for the site. This FS Report is organized in accordance with DER-10 Remedy Selection Reporting Requirements and CERCLA guidance and includes the following sections:

- Section 1 presents the purpose and regulatory framework governing the preparation of this FS Report and describes relevant background information
- Section 2 presents Remedial Investigation findings
- Section 3 identifies chemical-, action-, and location-specific standards, criteria, and guidelines
- Section 4 identifies constituents of concern and remedial action objectives

- Section 5 describes general response actions, conducts a technology screening and develops remedial action alternatives
- Section 6 presents the evaluation of remedial alternatives
- Section 7 presents a comparative analysis of remedial alternatives
- Section 8 provides a recommendation of a preferred alternative

## 1.3 BACKGROUND

This section provides background information regarding the site setting, current/historical uses of the site and site features.

### 1.3.1 Site Setting and Property Usage

The site is located on the south side of the New York State (NYS) Erie Barge Canal in a commercial area of the Village of Albion, immediately west of Ingersoll Street. The site location is shown on Figure 1. The site is one of two adjoining parcels formerly occupied by a single MGP. The western parcel (0.3 acres) is owned by National Grid and site investigation found no environmental conditions requiring remediation. According to a review of Sanborn Fire Insurance Maps, aboveground MGP structures that included a retort, two gas holders, and gas purification building occupied the eastern parcel in the late 1800s and early 1900s; MGP structures were no longer shown on post-1940s Sanborn Maps. Several structures associated with the MGP were located on the western parcel, including a coal storage warehouse, transformer station office building, gasholder, and two 5000-gallon gas/oil aboveground storage tanks (ASTs) (S&W, 2003). The current site boundary and surrounding area is shown on Figures 2A and 2B.

The eastern parcel (0.25 acres), which constitutes the site for this FS, currently is undeveloped and not used by its site owner, New York State Electric & Gas (NYSEG). A lift bridge and control tower border the site to the northeast. An active National Grid electric substation borders the site on the west (western parcel), two commercial properties are adjacent to the site on the south, and a walking trail along the NYS Barge Canal borders the site to the north. Ingersoll Street borders the site to the east. The site, adjacent properties, and properties south of East Bank Street are zoned as “Central Business District “. Property usage in the Central Business District is for commercial business operations. Property east of the site (east of Ingersoll Street) is zoned “General Commercial”. NYSEG has no development plans for the parcel.

### 1.3.2 Site Structures

Buildings or other occupied structures are not present at the site. Important non-MGP subsurface structures near the site include a 20-inch sanitary sewer and the lift pit of the Ingersoll Street lift bridge, both located east of the site. The sanitary sewer slopes northward from the intersection of East Bank and Ingersoll Streets, beneath the Erie Barge Canal, connecting to the sewer system on the north side of the canal. The sewer and associated pipe bedding is approximately 16.5 ft below grade at the East Bank and Ingersoll Street intersection, slopes to a depth of approximately 19.5 feet at the south edge of the canal adjacent to the lift bridge, and connects with the sewer system on the north side of the canal at a depth of approximately 21 feet. Drawings provided by the NYS Department of Transportation (NYSDOT) show the lift pit for the Ingersoll Street Lift Bridge extends several feet into bedrock and contains a sump. The sump operates with automatic level controls to remove water that accumulates in the bottom of the pit through surface water runoff and infiltration of groundwater. A high pressure natural gas pipeline traverses the property from the east and turns northward in the direction of the canal near the central portion of the site. A shallow storm sewer traverses the site in an east-west direction beneath the crushed stone access road located in the southern portion of the site.

### 1.3.3 Ingersoll Street Lift Bridge Reconstruction

From 2005 through 2007, a contractor retained by the NYSDOT reconstructed the Ingersoll Street Lift Bridge. The reconstruction project involved replacing above grade steel structures and repairing and/or reconstructing subgrade concrete structures and portions of the lift pit wall (see photo at right). Throughout the reconstruction project, construction equipment staging and material storage occurred on the Albion Former MGP Site. At project completion in the Fall 2007, the NYSDOT-contractor restored the ground surface of the site. The NYSDOT was unable to provide Geomatrix with restoration specifications or material quantities. According to the NYSDOT, the goal of site restoration was to return the site to pre-existing conditions. Based on a Geomatrix visual assessment of the site in October 2007, restoration activities included re-grading of the ground surface and addition of a 2 to 4-inch layer of topsoil with seeding. In addition, a 2 to 4-inch layer of crushed stone was placed along an access way from Ingersoll Street to the eastern entrance gate to the National Grid Substation. A new concrete pad was

constructed around the control tower for the lift bridge and the concrete sidewalk along Ingersoll Street was replaced. The vault and monitoring well MW-8, among other on-site wells, was covered with 6 to 8-inches of soil during restoration activities. During the September 2009 assessment at well MW-8, the soil covering the well was removed.

## 2.0 REMEDIAL INVESTIGATION FINDINGS

This section summarizes the findings of remedial investigations conducted at the site and describes the nature and extent of MGP impacts in site media. Investigations were conducted by Malcolm Pirnie (1998), Stearns & Wheler (1999 - 2003), and AMEC Geomatrix (2005-2008). The RI Report was approved by the NYSDEC on December 9, 2008.

### 2.1 SITE GEOLOGY AND HYDROGEOLOGY

Borings and monitoring wells completed during remedial investigations to characterize the site are shown on Figure 3. The investigations identified historic fill material placed over glacial till. Historic fill covers the site and extends onto adjacent properties. The fill material appears to have been used as grading material for historic commercial and industrial buildings that occupied the south side of the Barge Canal in the Albion Business District during the late 1800's and early 1900's. Geologic cross-sections depicting the geologic materials encountered at the site are shown on Figures 4A and 4B. The fill material generally consists of silt, sand and fine gravel and contains glass, coal fragments and cinder-like material and ash-like material (CLM/ALM) present at a depth of about 1 to 5 feet below grade. The till is dense, heterogeneous clayey silt with various mixtures of sand and gravel. Although the lower portion of the fill material above the till is saturated, samples of till exhibit saturated and unsaturated conditions. The hydraulic conductivity of the till is low based on low sustainable flow rates attained during pumping and low flow sampling. The estimated hydraulic conductivity for the till is approximately 3.5 X $10^{-4}$ cm/s. Bedrock underlies the glacial till at a depth of approximately 15 to 20 feet below ground surface (bgs); the upper bedrock is a weathered red sandstone of the Grimsby formation.

Groundwater elevations in the vicinity of the site are influenced by seasonal NYS Barge Canal operating water levels. During operating canal levels (non-winter season), groundwater flows from the site in a southeasterly direction toward the sanitary sewers located along Ingersoll and East Bank Streets. A convergent area of groundwater flow paralleling Ingersoll Street occurs east of the site (Figure 5). The lower head along the axis of convergent flow is caused by drainage to permeable sewer bedding and a constant low head maintained by active pumping in the bridge structure lift pit.

During the drained canal level (winter months), the groundwater flow direction shifts to an easterly and northeasterly direction. Groundwater flow directions are influenced by the following: 1. the Barge Canal operating level; 2. pumping of the lift pit sump that maintains a water level at the base of the pit constructed in bedrock; and 3. the backfill associated with the sanitary sewer along Ingersoll Street. The continuous (non-seasonal) generally easterly flow

component suggests the presence of the sanitary sewer is the most influential subsurface structure affecting groundwater flow direction.

## 2.2 NATURE AND EXTENT OF IMPACTS

As indicated in Section 1.0, investigations conducted on the western parcel, currently occupied by the active electric substation, have not identified areas of significant environmental concern at the substation property. The results described below are pertinent to the eastern parcel.

Investigations conducted on the eastern parcel identified constituents of potential concern (COPCs) namely benzene, toluene, ethylbenzene, and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs) in soil and groundwater above regulatory comparison criteria established in the RI Report. Soil sample analytical results were compared to NYSDEC TAGM #4046 values (appropriate for unrestricted use) and 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for commercial properties (herein referred to as Part 375 Restricted Use SCOs). Groundwater sample analytical data were compared to NYSDEC Division of Water and Technical and Operational Guidance Series (TOGS) Class GA water quality standards (groundwater standards).

### 2.2.1 Surface and Shallow Soil

PAHs were detected in surface and shallow soils (upper 6 feet) at concentrations above both TAGM #4046 values and Part 375 Restricted Use SCOs during remedial investigations. The PAHs are associated with the historic fill materials used to grade the area adjacent to the canal during the late 1800s and early 1900s. Currently, turf, topsoil, and crushed stone (placed following NYSDOT site restoration) covers ground surface across the site. Placement of this material occurred after remedial investigations were completed.

### 2.2.2 Subsurface Soil and Structures

**Subsurface Soil:** BTEX and total cyanide were not detected in subsurface soil above TAGM #4046 values or Part 375 Restricted Use SCOs. Several PAHs, typically related to MGP operations (i.e., naphthalene, methylnaphthalene, acenaphthene, acenaphthylene, anthracene), were detected in on-site subsurface soil. Naphthalene, the most commonly detected PAH at former MGP sites, was detected at a concentration above the Part 375 Restricted Use SCO at only one location (SB-11) at a depth of 12 feet below grade. This boring is located near the western holder where concentrations of other PAHs were detected above Part 375 Restricted Use SCOs.

MGP-derived residual material (coal tar) was encountered at one location on-site (MW-8) at a depth interval of 12 to 18 feet below the ground surface during the 2005 investigation. The accumulated coal tar (about 1 to 2 inches in height measured from the well bottom) was

removed from the well with a bailer. Subsequent well inspections were completed and additional tar was not found to accumulate in the well. This includes a recent assessment completed on August 26, 2009 to support the analysis of alternatives. As documented in correspondence to the NYSDEC dated September 18, 2009, no additional NAPL accumulation was observed during the assessment. The assessment was observed by the representatives from the NYSDEC and NYSDOH. The coal tar encountered at well MW-8 is limited to a localized area near the well and was characterized as immobile. Trace amounts of non-aqueous phase liquid (NAPL), in the form of ganglia and thin laminae, were observed in the upper till at boring SUPP-B-3 and SUPP-B-4 (below depths of 15 feet bgs). No other borings encountered residual coal tar material and MGP-related impacts were not identified in off-site soil.

Black CLM/ALM (mixture of coal fragments and partially combusted ash-like material) was observed in soil borings advanced across the majority of the site area, including each of six borings advanced along the southern property boundary (SB-19 through SB-25). CLM/ALM material was not observed in samples from below depths of 6 feet bgs in any of the on-site soil borings advanced for the RI investigation. The majority of the CLM/ALM was found to occur in the upper two feet of on-site fill. PAH concentrations exceeding Part 375 Restricted Use SCOs were identified in all but one subsurface and surface soil samples analyzed that contained CLM/ALM. Total PAH concentrations ranged from 5.87 mg/kg (SB-27) to 8623 mg/kg (SB-19), but were generally less than 500 mg/kg. Off-site, the distinct CLM/ALM layer was not present and samples of the fill material contained an ash-like material with mixtures of coal fragments in a soil matrix. Figures 6, 7, and 8 summarize chemical constituents in site surface/shallow soil, subsurface, and visual MGP impacts, respectively.

**Subsurface Structures:** Two important subsurface structures were identified and investigated: the sanitary sewer below Ingersoll Street; and the lift pit for the Ingersoll Street Lift Bridge. Both structures influence the groundwater flow direction at the site, as discussed in Section 2.0. Analytical results for the sample collected from the Ingersoll Lift Bridge pit sump detected several PAHs at very low, estimated concentrations. BTEX were not detected. The data suggest the presence of grease observed coating the cables and gears in the lift pit affected water quality in the lift pit sump. Total cyanide was detected in the water sample collected from the lift pit at a concentration (0.473 mg/L) above the groundwater standard of 0.2 mg/L.

The investigations concluded that organic MGP-derived chemicals had not impacted the lift pit at the Ingersoll Street Lift Bridge and MGP residual material had not entered the brick-lined sanitary sewer manholes.

### 2.2.3 Groundwater

Dissolved phase MGP-related constituents (i.e., BTEX, naphthalene, and total cyanide) were detected at concentrations above groundwater standards in overburden groundwater at two locations on-site: monitoring well MW-5 and MW-8. Monitoring well MW-5 is downgradient of MGP-impacted soils identified in the vicinity of the former western gas holder. Monitoring well MW-8 is located in an area where coal tar residual material was present. The absence of MGP-related constituents in other monitoring wells located on- and off-site indicates COCs present in unsaturated historic fill does not affect groundwater quality.

Hydrogeologic data indicate the sanitary sewer below Ingersoll Street and the lift pit for the Ingersoll Street Lift Bridge create a hydraulic barrier to groundwater flow in an eastward direction. Total cyanide was detected in the Lift Bridge sump pit at concentrations similar to those detected on-site; however, MGP-related organic compounds were either not present or present at trace level concentrations (below groundwater standards). As stated in the DEC-approved RI Report, natural attenuation of organic compounds in the water-bearing zone has occurred. Off-site groundwater quality (monitoring wells MW-7 {bedrock well}, 9, and 10) and groundwater quality at the downgradient edge of the site's southern property boundary (monitoring well MW-6) has not been adversely affected by on-site soil or groundwater. Groundwater data are summarized on Figure 9.

### 2.2.4 Soil Vapor

VOCs were not detected in on-site shallow soil samples above Part 375 Restricted Use SCOs and no occupied structures exist on-site. A commercial business (currently a hair salon) is located immediately adjacent to the southern site boundary. MGP-related VOCs have not been detected in wells located at the southern downgradient site boundary (MW-6) or off-site (MW-7, MW-9 and MW-10) in the direction of groundwater flow. The relevancy of soil vapor migration may need to be investigated in the future if land use on-site or adjacent to the site changes (i.e., future development).

## 2.3 HUMAN HEALTH EXPOSURE ASSESSMENT

The human health exposure assessment (HHEA) conducted for the RI was completed in accordance with the New York State Department of Health (NYSDOH) guidance described in NYSDEC's Draft TAGM DER-10. The HHEA identified constituents of potential concern (COPCs) as: BTEX and PAHs in on-site soil and groundwater. A completed human health exposure pathway was not identified in connection with subsurface soils or groundwater under current site conditions. There is, however, potential exposure to MGP-related constituents via inhalation of vapors, direct contact, and accidental ingestion of subsurface soil and

groundwater under a potential future scenario where an on-site construction and/or utility worker would be involved with subsurface excavation. Other than the construction worker exposure scenario, exposures to impacted groundwater are not expected because the water is not being used for drinking water purposes (the area is served by public water). Although the site is not fenced, direct contact with on-site soils by the general public is not expected since a layer of clean fill is present at the site. However, quality assurance information concerning the thickness and extent of clean fill placement could not be provided by the NYSDOT's contractor; therefore, direct contact with on-site soil is potentially feasible where the clean fill layer is eroded or displaced.

## 3.0 IDENTIFICATION OF STANDARDS, CRITERIA, AND GUIDELINES

This section provides a summary of the regulations that are considered applicable or relevant and appropriate requirements (ARARs) to remediation of the site and establishes the potential standards, criteria, and guidelines (SCGs) that have been identified for the site. The SCGs considered for the remedial alternatives analyzed in this FS Report were classified as follows:

***Chemical-Specific SCGs*** – These SCGs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values for each constituent(s) of concern (COC). These values establish acceptable concentrations of chemical constituents found in site media.

***Action-Specific SCGs*** – These SCGs are technology or activity based requirements or limitations on actions taken with respect to hazardous waste management.

***Location-Specific SCGs*** – These SCGs are restrictions placed on the conduct of activities solely because of locality based requirements.

Feasibility study chemical-specific, action-specific, and location-specific SCGs are summarized in Tables 1A through 1C.

# 4.0 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

## 4.1 CONSTITUENTS OF CONCERN AND REMEDIAL GOALS

This section presents the remedial action objectives (RAOs) for impacted media identified at the site. These RAOs represent medium-specific goals that are protective of human health and the environment (USEPA, 1988; NYSDEC, 2002). These objectives are, in general, developed by considering the results of the exposure evaluation and with reference to potential SCGs identified for the project area. The purposes for developing RAOs are to specify the constituents of concern (COCs) at the project area and to assist in the development of quantitative goals for cleanup of the COCs in each medium that requires remediation. COCs for the Albion Former MGP site are:

- PAHs in site shallow soil
- BTEX and PAHs in site subsurface soil
- BTEX and PAHs in site groundwater

As described in Section 2.3, a qualitative human health exposure assessment (HHEA) was conducted to identify COPCs and evaluate human receptors at the site and nearby areas based on current and foreseeable land use. The HHEA found that levels of site-related COPCs in some on-site soil and groundwater exceeded comparative screening criteria. However, under current use there are no existing exposure routes, on- or off-site, to subsurface soil. Potential human exposure to impacted subsurface soil is limited to construction workers conducting excavation activities (through incidental dermal contact, inhalation, and ingestion). Construction workers could be similarly exposed to impacted groundwater. Other than the construction worker scenario, there are no complete on-site or off-site exposure routes to groundwater because groundwater in the vicinity of the site is not used as a drinking water source and municipally supplied water is available and is used by area residents and business occupants. The potential exposure of construction workers to impacted soil and groundwater would be mitigated by using properly trained and equipped personnel and implementing engineering and administrative controls.

## 4.2 REMEDIAL ACTION OBJECTIVES

According to USEPA guidance, RAOs for protecting human receptors can include qualitative and quantitative remediation goals for COCs in association with an exposure route (e.g., subsurface soil, groundwater ,etc.) because protectiveness may be achieved qualitatively by eliminating exposure (such as covering an area, limiting access, or providing an alternate water supply) as well as reducing the quantifiable levels of COCs.

The RAOs for the site are to eliminate or reduce, to the extent practicable:

- Ingestion of MGP-related COCs in soil and groundwater
- Contact with or inhalation of MGP-related COCs in soil and groundwater
- Source of MGP-related impacts which affect groundwater quality

The RAOs above are consistent with media specific remedial action objectives identified in remedy selection methods presented in NYSDEC Draft DER-10 (NYSDEC, 2002) and New York State's Approach to the Remediation of Former MGP Sites (NYSDEC, www.dec.ny.gov/chemical/8430.html).

### 4.2.1 Surface and Shallow Soil

The HHEA did not identify a complete exposure pathway and a layer of clean fill was place over the site following Ingersoll Street lift bridge reconstruction. However, the site is not fenced, is readily accessible to the public via Ingersoll Street and the Canal walking path, and, other than mowing, a maintenance program that would ensure integrity of the cover soils does not exist. Furthermore, the thickness and extent of clean fill and crushed stone placed over the site by the DOT construction contractor has not been quantified. Therefore, a RAO for surface soil will target reducing potential future risks associated with human exposure to COCs in the shallow soil below the layer of clean fill.

### 4.2.2 Subsurface Soil

The HHEA concluded that there are no existing exposure routes (on-site or off-site) to subsurface soil. The potential for direct contact with subsurface soil is likely to occur only during soil excavation/trenching construction activities. RAOs applicable to subsurface soil were developed to be protective of human health and the environment, to the extent practicable, and to assist with identifying potential remedial technologies. These RAOs are targeted at reducing potential future risks associated with human exposure to subsurface soil COCs. Protection of the environment would be achieved by addressing the remediation of MGP-source materials, to the extent practicable.

### 4.2.3 Groundwater

Groundwater at the site is not used for drinking and municipally-supplied water is available to Village of Albion; therefore, the greatest potential for exposure is via direct contact that may occur during excavation/trenching construction work where depths are greater than 8 to 10 feet below ground surface.

RAOs applicable to groundwater were developed to be protective of both human health and the environment, to the extent practicable. Human health would be protected by reducing, to the extent practicable, exposure to site-related COCs. Protection of the environment would be

accomplished by reducing, to the extent practicable, future COC impacts to groundwater and long term restoration of the quality of groundwater to current standards, to the extent practicable.

# 5.0 TECHNOLOGY SCREENING AND DEVELOPMENT OF REMEDIAL ALTERNATIVES

## 5.1 INTRODUCTION

Remedial technology identification and screening presented in this section consists of: identification of general response actions to satisfy the RAOs; identification of potentially applicable remedial technologies that fall within the general response categories; and screening of those technologies with respect to their relative effectiveness, technical implementability and relative cost in meeting the RAOs for the site. Technologies identified for this MGP site have been selected from the host of technologies considered potentially effective for use at MGP sites in general, and include primarily those technologies that have been previously implemented successfully at other MGP sites. The most promising technologies are retained and carried forward into the development of remedial alternatives.

## 5.2 GENERAL RESPONSE ACTIONS

Based on the RAOs identified in Section 4.2, the following site-specific General Response Actions (GRAs) are established for soil and groundwater at the site:

- No Further Action
- Institutional Controls
- In-Situ Containment/Controls
- In-Situ Treatment
- Removal

### 5.2.1 No Further Action

In many feasibility studies, the no action response is typically identified and carried through the evaluation process as a point of comparison for other actions.

### 5.2.2 Institutional Controls

Institutional controls are applicable to soil and groundwater. These actions include access control measures, deed restrictions with environmental easements, and established procedures for managing ground-intrusive work through implementation of a Site Soils and Groundwater Management Plan. Specific institutional controls could be tailored to the remedy chosen.

### 5.2.3 In-Situ Containment/ Barrier

Containment is applicable to soil and groundwater at the site. For groundwater, containment actions involve isolation of contaminants by constructing and maintaining physical barriers or systems that prevent potential migration. These include sheet pile walls, soil-bentonite cutoff walls, and active hydraulic control. For soil, containment actions include constructing cover systems or other barriers to prevent contact with the soil.

### 5.2.4 In-Situ Treatment

In-situ treatment is applicable to the soil and groundwater. Treatment alters the physical and/or chemical nature of the media to cause a change in contaminant mass, mobility, or toxicity. Treatment can be accomplished in-situ or ex-situ. Examples of in-situ treatment include chemical oxidation and stabilization.

### 5.2.5 Removal

Excavation is applicable to shallow soil. Excavation of impacted shallow soils could be accomplished using conventional construction equipment and methods. Deeper excavations would pose significant challenges considering the size of the site, above ground power lines that parallel the canal, and the number of on-site subsurface structures (related to the lift-bridge and natural gas pipeline). Sheet pile and shoring of deeper excavations would be necessary in areas where deeper excavation is necessary. Excavation in the saturated zone might require temporary dewatering and treatment systems. Excavation of soil is considered feasible but is realistically limited to shallow excavation that would not require sheeting of excavation sidewalls near site boundaries or subsurface structures and equipment that would not require relocation of overhead power lines. Soil removed by excavation would need to be further remediated by disposal or treatment.

For each of these GRAs, remedial technologies have been identified for each impacted medium as described below. The No Further Action GRA has been included and retained throughout the screening evaluation as required by USEPA and NCP guidance.

## 5.3 TECHNOLOGY IDENTIFICATION AND SCREENING

Remedial technologies potentially applicable for achieving the RAOs for the site were identified through a variety of sources including vendor information, engineering experience and review of available literature, including the following documents:

- NYSDEC TAGM #4030 – Selection of Remedial Actions at Inactive Hazardous Waste Sites (NYSDEC, 1990)

- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final) (USEPA, 1988)

- Technology Screening Guide for Treatment of CERCLA Soils and Sludges (USEPA,1988)

- Management of Manufactured Gas Plant Sites (Gas Research Institute, 1996)

- USEPA Technology Briefs – Data Requirements for Selecting Remedial Action Technologies (various dates)

Preliminary screening was performed to focus the number of potentially applicable technologies on the basis of technical implementability and effectiveness (long- and short-term). Technical implementability was evaluated based on site characterization information collected during the remedial investigations to screen out technology types and process options that could not be effectively implemented at the site. The effectiveness of a technology is determined through its ability to achieve RAOs.

### 5.3.1 Surface and Shallow Soil

RAOs were developed to mitigate exposures to shallow soil containing MGP-related COCs immediately below the restored ground surface of the site. Therefore, maintaining the existing surface cover material which serves as a barrier to minimize direct contact with COCs in shallow soil at the former MGP property would achieve these RAOs. However, the site is not fenced, is readily accessible to the public via Ingersoll Street and the Canal walking path, and, other than mowing, a maintenance program that would ensure integrity of the cover soils does not exist. Furthermore, the thickness and extent of clean fill and crushed stone placed over the site by the DOT construction contractor has not been quantified. Removing shallow soils and placing clean fill cover would achieve RAOs. Barrier technology will be retained to address surface and shallow soil at the site.

### 5.3.2 Subsurface Soil

Table 2 summarizes the screening of technologies evaluated for general response actions identified in Section 5.2 for subsurface soil. As shown in the table, the technologies screened include No Further Action and Institutional Controls. The No Further Action alternative is included as a baseline to which other remedial alternatives are compared. Although this alternative does not include active remedial actions, it will be retained for further consideration. Institutional controls for access restrictions (restrictions in the form of governmental, proprietary, enforcement or permit controls and/or informational devices [e.g., signs, postings,

etc.]) were retained for further evaluation. Because institutional controls would not treat, contain or remove MGP-impacted subsurface soil, institutional controls alone would not achieve the established RAOs. However, institutional controls may partly achieve the RAO of reducing, to the extent practicable, potential human contact with, inhalation and ingestion of MGP-related COCs. Institutional controls can be added to enhance other selected remedial technologies.

Other technologies considered include:

**In-Situ Containment/Barrier** – As described in Section 5.3.1, shallow soil removal and soil cover placement (barrier technology) was retained for further consideration. The barrier would provide continued protection against exposure to shallow soil containing COCs. More extensive capping and containment technologies were not considered because of their relative higher cost with minimal additional protection of exposure and no reduction in toxicity or volume of impacts. Subsurface containment options such as sheet pile or slurry walls would neither treat nor remove MGP impacts and, considering the low mobility of COCs at the site, would provide little or no environmental benefit. The equipment footprint required to construct subsurface barriers is large and is larger than the available space at the site. Subsurface containment technologies are therefore dropped from further consideration.

**In-Situ Treatment** – The in-situ remedial treatment technologies identified for subsurface soil include solidification/stabilization, steam injection/extraction (steam injection to mobilize COCs followed by extraction), chemical treatment and biological treatment. Each of these treatment technologies requires bench scale testing and, often, pilot scale testing to determine effectiveness in reducing contaminant mobility, toxicity and/or volume. These technologies are generally cost-effective only when applied at larger sites (greater than 1 acre) and require large areas for equipment staging – beyond that available at the Albion site. Therefore, in-situ treatment technologies will not be considered for further evaluation and will not be developed as a component of a remedial alternative for the site.

**Removal** – Excavation of subsurface soil was retained for further evaluation. This technology is a proven process for removing impacted soil and MGP material. Excavation of soil is considered implementable; however, site-specific constraints (e.g., underground utilities and logistics of site) limit the extent to which excavation could be implemented. Where deeper excavations are considered, sheet piling with bracing and shoring of underground utilities and structures will be necessary. The equipment required to install steel sheeting and the required footprint of the working space required to install sheeting are large. Given the small size of the site, the space required to complete deeper excavations places poses limitations on the implementability of deeper excavations. Equipment and labor capable of soil excavation is

readily available, and while unit capital costs can be high (primarily for the disposal of excavated soil), engineering, mobilization, and O&M costs are considered low. Excavated soil can be treated off-site and properly disposed of or disposed directly in a non-hazardous solid waste or RCRA waste landfill.

### 5.3.3 Groundwater

Table 3 summarizes the screening of technologies evaluated for general response actions identified in Section 5.2 for groundwater. The technologies considered are remedial options that would address COCs in groundwater (BTEX). As shown in the table, the technologies include No Further Action and Institutional Controls. The No Further Action alternative is included as a baseline to which other remedial alternatives are compared. It will be retained for further consideration. Institutional controls for groundwater usage restrictions (restrictions in the form of governmental, proprietary, enforcement or permit controls and/or informational devices [e.g., signs, postings, etc.]) were retained for further evaluation. Because institutional controls would not treat or contain MGP-related constituents in groundwater, institutional controls alone would not achieve the established RAOs. However, institutional controls can be added to enhance other remedial technologies.

Other technologies considered include:

**In-Situ Containment/Hydraulic Control** – The in-situ containment/hydraulic control technologies considered for groundwater consist of hydraulic control (groundwater extraction using recovery wells) and subsurface barriers such as slurry walls or grout curtains with low rate groundwater extraction required to induce an inward hydraulic gradient. Extracted groundwater would require either on-site or off-site treatment. Operation and maintenance costs are high for groundwater barriers that require active collection and treatment. Transport of MGP-related COCs in groundwater to off-site areas has not occurred; therefore, containment options are not considered to be necessary. Therefore, containment technologies for groundwater will not be considered for further evaluation.

**In-Situ Treatment** – The in-situ remedial treatment technologies considered for groundwater include chemical oxidation, active biological stimulation/treatment (i.e., degradation of constituents using enhancements), passive biological treatment (i.e., natural attenuation), and sparging. As described in Section 2.2.3, field evidence indicates natural attenuation of COCs is occurring at the site. While low concentrations of total cyanide were detected in the sump of the groundwater collection sump of the Ingersoll Lift Bridge lift pit, organic MGP-related constituents (BTEX and naphthalene) were not detected or found to be present at trace levels (below groundwater standards). Since the sump pit collects site groundwater and detected COC concentrations are very low in the pit, natural attenuation processes, primarily aerobic

biodegradation, must be occurring. These observations are documented in the RI Report. Therefore, in-situ treatment to enhance aerobic biodegradation would be expected to further reduce on-site organic constituent levels. While in-situ treatment technologies are readily implementable, the effectiveness of these technologies may be limited by the presence of MGP source materials in the unsaturated zone. Soil borings completed during site investigations did not identify MGP source materials in the unsaturated zone. In-situ treatment technologies will be retained for further evaluation.

**Removal** – Groundwater extraction can be conducted using groundwater recovery wells and/or horizontal drains. Extracted groundwater requires either on-site or off-site treatment. Removal and treatment of water to reduce concentrations of MGP-related COCs to achieve Class GA groundwater quality standards often requires decades and operation of recovery and treatment systems are typically lengthy. Groundwater extraction and treatment will not be retained.

As indicated on Table 3 removal actions for soil can reduce the source of COCs which may migrate to groundwater and provide a remediation benefit to groundwater.

### 5.3.4 Summary of Retained Technologies

The technologies retained for further analysis are:

Soil:

- Institutional Controls
- Surface Barrier
- Excavation

Groundwater:

- Institutional Controls
- Passive monitored natural attenuation
- Enhanced monitored natural attenuation

These technologies are developed into remedial action alternatives in Section 5.4.

## 5.4 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

This section assembles retained remedial actions and technologies into a list of remedial alternatives applicable to soil and groundwater. These alternatives are described in detail below and are evaluated in Section 6.0 using criteria specified in NYSDEC DER-10 (NYSDEC, 2002). In consideration of technological, site, medium, and contaminant-specific factors,

remedial alternatives for soil and groundwater developed to address RAOs are identified and described below.

### 5.4.1 Soil Remedial Alternatives

Including the No Further Action alternative, four alternatives (S-1 through S-4) have been developed to address site soil:

- S-1 No Further Action
- S-2 Institutional Controls
- S-3 Limited Surface/Shallow Soil Removal and Soil Cover Installation
- S-4 Removal of COCs at Concentrations above 6NYCRR Part 375 Unrestricted Property Use SCOs.

#### *5.4.1.1 Alternative S-1 – No Further Action*

Under the no further action alternative, no remedial activities beyond the RI/FS would be conducted at the site.

#### *5.4.1.2 Alternative S-2 – Institutional Controls*

This alternative would implement institutional controls in the form of governmental, proprietary, enforcement, or permit controls and/or informational devices (e.g., signs, postings, etc.) to provide special protocols for any excavation and soil use at the site. A Site Management Plan (SMP) would be prepared and formalized in an environmental easement for the site property. The SMP would include the following:

1. Provide procedures for handling residual contaminated soils that may be excavated from the site during future redevelopment or become exposed after demolition and removal of existing structures including underground structures. The SMP would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations.

2. Evaluate the potential for vapor intrusion for any buildings to be developed on the site, including provision for mitigation of any impacts identified.

3. Identify any future use restrictions or institutional controls.

#### *5.4.1.3 Alternative S-3 –Limited Surface/Shallow Soil Removal and Soil Cover Installation*

This alternative involves removing the upper two feet of soil and placing a soil cover across the site to prevent direct contact with on-site surface/shallow soil. The area of soil removal and cover placement is shown on Figure 10. Soil removal would include the upper two feet of existing surface soil and shallow historic fill with a small front loader excavator (i.e., Bobcat type). This action would remove a majority of the CLM/ALM from the site. The removed soil would be characterized and hauled to an off-site disposal facility. A clean soil demarcation layer (i.e., geotextile or flat lying snow fence) would be placed across the bottom of the excavation prior to backfilling. The demarcation layer would support potential future intrusive worker activities (performed through implementing elements of a SMP) by providing an easily recognizable material that separates clean soil from the historic fill. The excavation would be backfilled with 1.5 feet of certified clean soil and properly graded to maintain current surface water drainage patterns. The certified clean soil used as backfill will be obtained from an approved source per allowable constituent levels for imported fill specified in Appendix 5A of NYSDEC DER-10 and in 6NYCRR Part 375 6.7(d). Approximately 6-inches of topsoil would be placed above the clean fill and seeded. The area of the access drive to the substation from Ingersoll Street would be covered with crushed stone. The greater thickness of barrier materials would further minimize direct contact with shallow soils. This alternative also requires an SMP. In addition to the SMP contents listed above for Alternative S-2, the SMP specified for Alternative S-3 will include (or reference) a Cover Maintenance Plan which would also be formalized in the environmental easement.

#### *5.4.1.4 Alternative S-4 – Remove Soil Above 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives*

This alternative involves the excavation and removal of soil containing COCs above Part 375 Unrestricted Use SCOs and is presented as a NYSDEC requirement. Alternative S-4 is developed and analyzed but is not considered to be practical or reasonable considering: the expansive nature of historic fill that parallels the canal in the Village of Albion (well beyond the site limits), the current and future site use, and numerous technical challenges of removing a high volume of soil from a relative small space given the overhead and underground utilities on-site and subsurface structures associated with the lift bridge. Under this alternative, all of the historic fill material (estimated to include the upper 8 to 10 feet of soil/fill) as well as deeper soils in the area of the western gas holder and impacted soils in the area well MW-8 would be removed. Where the deeper soils would be excavated, soil removal would extend to an approximate depth of 18 to 20 feet below grade. Excavating soil to a depth of 10 feet along site boundaries would necessitate sheet pile installation around the perimeter of the site. Sheeting and bracing would be needed to complete deeper excavations in the area near the lift-bridge vault structure and control tower. The area of excavation is shown in Figure 11. It

would not be feasible to remove the small, localized area of NAPL ganglia present in the upper till at SUPP-B-3 because of the proximity to subsurface structures and utilities that exist in the northeast corner of the property adjacent the lift bridge control tower would necessitate sheeting which could not be installed without removing the control tower.

This alternative would not require implementation of an SMP since surface and shallow soils containing COCs above SCOs would be removed. This alternative would satisfy RAOs for soil by minimizing contact and ingestion of COCs in soil. By removing source materials that impact on-site groundwater quality, this alternative would also serve to reduce COCs in groundwater to the extent feasible. Most of the soil removed for this alternative would be historic fill materials unrelated to the past MGP activities.

### 5.4.2 Groundwater Remedial Alternatives

Including the No Further Action alternative, four remedial alternatives have been developed to address on-site MGP impacted groundwater. Alternatives are described below.

#### *5.4.2.1 Alternative GW-1 – No Further Action*

Under this alternative, no active remedial activities would be conducted.

#### *5.4.2.2 Alternative GW-2 – Institutional Controls*

This alternative would require the implementation of institutional controls in the form of governmental, proprietary, enforcement, or permit controls to restrict groundwater usage.

#### *5.4.2.3 Alternative GW-3 – Monitored Natural Attenuation*

Naturally occurring chemical, biological, and/or physical processes that degrade MGP related COCs in groundwater would be monitored under this alternative. As described in the Comprehensive RI Report (December 2008), these processes exist at the site and would continue to reduce the toxicity, mobility, and mass of dissolved phase MGP constituents in groundwater. A long-term groundwater monitoring program would be developed for the site to monitor on-site and off-site groundwater quality. The monitoring program would assess groundwater flow direction, conditions affecting natural attenuation processes, and monitor concentrations of COCs in groundwater. It is anticipated that three existing and two new downgradient monitoring wells would be sampled semi-annually for the first five years and annually thereafter.

Institutional controls as described above for Alternative GW-2 would also be included in Alternative GW-3.

#### *5.4.2.4 Alternative GW-4 – Enhanced Monitored Natural Attenuation*

This alternative would utilize oxygen-releasing compounds (ORC) and/or other amendments to further enhance natural biological processes that degrade dissolved phase MGP related constituents in on-site groundwater. ORC and amendments would be delivered through vertical wells installed in the area of well MW-5 and MW-8. It would also include a natural attenuation monitoring program as described in Section 5.4.2.3.

Institutional controls as described above for Alternative GW-2 would also be included in Alternative GW-4.

# 6.0 EVALUATION OF REMEDIAL ALTERNATIVES

NYSDEC requires an analysis of remedial alternatives against seven criteria and specifies factors to consider for each criterion. The seven criteria, also described in NCP regulations and in NYSDEC Draft DER-10 include the following:

- Short-Term Effectiveness
- Long-Term Effectiveness
- Reduction of Toxicity, Mobility, or Volume
- Implementability
- Compliance with SCGs
- Overall Protection of Human Health and the Environment
- Cost

Evaluation criteria are described in Section 6.1 and the evaluation of alternatives is presented in Section 6.2. In addition to the seven criteria described above, Community Acceptance will be evaluated after the public review of the remedy selection process as part of the NYSDEC's selection/approval of a remedy for the site. A Proposed Remedial Action Plan (PRAP) will be prepared by the NYSDEC for public review and comment. The selected remedy will consider community comments received by the NYSDEC.

## 6.1 EVALUATION CRITERIA

### 6.1.1 Short-term Impacts and Effectiveness

The potential short-term adverse impacts and risks of the remedy to the community, site workers, and the environment during the construction and/or implementation are evaluated. The evaluation includes a discussion of how the identified adverse impacts and health risks to the community or workers at the site will be controlled and the effectiveness of the controls. Engineering controls that could be used to mitigate short term impacts (i.e., dust control measures) will also be considered. Included in the evaluation of short-term impacts will be a qualitative assessment of contributions to greenhouse gas emissions. The relative greenhouse gas emissions from sources such as combustion of fossil fuels associated with transportation, operation of treatment systems, and other technologies will be considered.

The length of time needed to achieve the remedial objectives is also addressed in this evaluation.

### 6.1.2 Long-term Effectiveness and Performance

This criterion evaluates the long-term effectiveness of the remedy after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated:

- The magnitude of the remaining risks (i.e., will there be any significant threats, exposure pathways, or risks to the community and environment from the remaining wastes or treated residuals?)
- The adequacy of the engineering and institutional controls intended to limit the risk
- The reliability of these controls
- The ability of the remedy to continue to meet RAOs in the future

### 6.1.3 Reduction of Toxicity, Mobility, or Volume with Treatment

This criterion evaluates the remedy's ability to reduce the toxicity, mobility, or volume of site contamination. Preference is given to remedies that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the site.

### 6.1.4 Implementability

The technical and administrative feasibility of implementing the remedy is evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, and other factors influencing the construction of the alternative.

### 6.1.5 Compliance with Standards, Criteria, and Guidance (SCGs)

Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. Chemical-specific, action-specific, and location specific-SCGs for the site are summarized in Table 1A through 1C. The evaluation will include a discussion of SCGs that affect each alternative.

### 6.1.6 Overall Protection of Public Health and the Environment

This criterion entails an evaluation of the remedy's ability to protect public health and the environment, based on assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through removal, treatment,

engineering controls or institutional controls. The remedy's ability to achieve each of the RAOs is evaluated.

### 6.1.7 Cost

Capital, operation, maintenance, and monitoring costs are estimated for the remedy and presented on a present worth basis.

## 6.2 EVALUATION OF ALTERNATIVES

This section presents the detailed evaluation of the remedial alternatives for soil and groundwater with respect to the evaluation criteria described in Section 6.1.

### 6.2.1 Soil Remedial Alternatives

Five soil remediation alternatives have been developed to address impacted soils at the site:

- S-1 No Further Action
- S-2 Institutional Controls
- S-3 Limited Surface/Shallow Soil Removal and Installation of Soil Cover
- S-4 Remove Soil above 6NYCRR Part 375 Unrestricted Use SCOs

These alternatives are evaluated below.

#### *6.2.1.1 Alternative S-1 – No Further Action*

Technical Description: Under the no further action alternative, no remedial actions would be conducted to address soils at the site. There would be no restrictions pertaining to soil use or management placed on the current or future uses of the property.

Short-Term Effectiveness: The no further action alternative would not pose any short term risks associated with implementation as it involves no construction activities. Since the existing site cover would likely prevent human exposure to site soils (except for the on-site construction worker exposure scenario), it would most likely be effective in attaining the RAOs for soil over the short term. However, the existing and future integrity of the existing cover has not been quantified so its overall protectiveness over the near-term and long-term is uncertain.

Long-Term Effectiveness: The no further action alternative would be less effective in attaining the RAOs for soil over the long term. Without proper maintenance, the existing site cover would be subject to erosion and underlying soils could become exposed. Future subsurface

construction work performed at the site, which would be allowed without restriction under this alternative, could not only expose workers but could result in the uncovering and uncontrolled redistribution of subsurface soils on the ground surface. The no further action alternative cannot be considered to have satisfactory long term effectiveness in attaining the RAOs. It would have no significant effect on reducing any continuing source of MGP impacts to groundwater.

Reduction of Toxicity, Mobility, or Volume: Under the no further action alternative the reduction of toxicity, mobility or volume of contamination would only occur as a result of the ongoing natural attenuation processes at the site. As such, no further action would result in progressively lower concentrations of COCs in soil over time.

Implementability: The implementability criterion is not applicable to the no further action alternative.

Compliance with SCGs: The no further action alternative would not achieve any improvement with respect to compliance with SCGs.

Overall Protection of Human Health and the Environment: Over the short term, the no further action alternative is protective of human health and the environment as the existing site cover prevents contact with impacted soils. As indicated above, over the long term the site cover will become less effective as it is allowed to deteriorate in the absence of a proper maintenance program. The lack of site restrictions would allow future exposures potentially associated with subsurface excavation activities.

Cost: There is no cost associated with the no further action alternative.

#### *6.2.1.2 Alternative S-2 – Institutional Controls*

Technical Description: Alternative S-2 would implement institutional controls in the form of governmental, proprietary, enforcement, or permit controls and/or informational devices (e.g., signs, postings, etc.) to provide special protocols for any excavation and soil use at the site. This includes an SMP which would be prepared and formalized in an environmental easement for the site property. The SMP would include the following:

1. Provide procedures for handling residual contaminated soils that may be excavated from the site during future redevelopment or become exposed after demolition and removal of existing structures including underground structures. The SMP would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations and other SCGs pertaining to soil disposal (Table 1A).

2. Evaluate the potential for vapor intrusion for any buildings to be developed on the site, including provision for mitigation of any impacts identified.

3. Identify any future use restrictions or institutional controls.

Short-Term Effectiveness: Alternative S-2 would not pose any short term risks associated with implementation as it involves no construction activities. Since the existing site cover prevents human exposure to site soils (except for the on-site construction worker exposure scenario), it would be effective in attaining the RAOs for soil over the short term.

Long-Term Effectiveness: Alternative S-2 would be marginally more effective than Alternative S-1 in attaining the RAOs for soil over the long term. It is subject to the same deficiency with respect to the lack of a cover maintenance program to prevent erosion and potential exposing of underlying soils. However, the SMP would control any subsurface construction work performed at the site in that it would specify safety measures to prevent worker exposure and procedures for proper soil handling/disposal and excavation closure. However, without a formal cover maintenance program, Alternative S-2 cannot be considered to have satisfactory long term effectiveness in attaining the RAOs. It would have no significant effect on reducing any continuing source of MGP impacts to groundwater.

Reduction of Toxicity, Mobility, or Volume: Alternative S-2 would not reduce toxicity, mobility or volume of contamination except as results from the ongoing natural attenuation processes at the site. As such, Alternative S-2 would result in progressively lower concentrations of COCs in soil over time. .

Implementability: The incorporation of environmental easements and SMPs into site remediation programs would be subject to legal review and follow the necessary legal process in the State of New York. However, these controls are commonly required for remediated sites in New York and present no implementability concerns.

Compliance with SCGs: Alternative S-2 would not achieve any improvement with respect to compliance with SCGs.

Overall Protection of Human Health and the Environment: Over the short term, Alternative S-2 is protective of human health and the environment as the existing site cover prevents contact with impacted soils and would meet the RAOs for soil. As indicated above, over the long term the site cover will become less effective as it is allowed to deteriorate in the absence of a proper maintenance program. The lack of site restrictions would allow future exposures potentially associated with subsurface excavation activities.

Cost: The costs to implement Alternative S-2 are associated with the preparation of the SMP and legal fees associated with the preparation and filing of the environmental easement. The estimated cost to implement Alternative S-2 is $140,000.

#### *6.2.1.3 Alternative S-3 – Limited Surface/Shallow Soil Removal and Soil Cover Installation*

Technical Description: Alternative S-3 involves removing the upper two feet of soil and placing a soil cover across the site to prevent direct contact with on-site surface/shallow soil. Components of Alternative S-3 include:

1. Excavate 2-feet of surface/shallow soil and properly dispose at an off-site facility.

2. Backfill excavation with clean soils and grade surface to maintain current drainage.

3. Add topsoil, seed and replace gravel access road to substation.

4. Prepare and implement SMP including a Cover Maintenance Plan and associated institutional controls. The Cover Maintenance Plan specifies the maintenance schedule, inspection requirements and repair procedures to ensure long term effectiveness of the cover in presenting a barrier to exposure.

Short-Term Effectiveness: Alternative S-3 poses no substantial short term risks to human health or the environment. Dust and erosion control measures will be employed during soil removal and placement of the clean cover materials. Placement of the cover materials will require uncovering and exposing shallow impacted site soils. Dust and odor controls and monitoring would be necessary to minimize exposure by site workers and community members. Fossil fuel use and emissions (including greenhouse gas emissions) would be limited to operation earth moving equipment and 30 to 40 haul trucks over the course of three to four weeks. These emissions are considered moderate.

The purpose of the enhanced cover is to prevent exposures to the underlying site soils and thereby achieve the soil RAOs. The cover will be immediately effective in achieving this. The grass cover, which is an important component of the long term stability (but does not affect short term effectiveness), may take several weeks to establish.

The placement, compaction and grading of the cover will be a relatively short term construction project. Emissions, including greenhouse gas emissions, from construction equipment would occur intermittently over a period of approximately one month.

Long-Term Effectiveness: Alternative S-3 includes a Cover Maintenance Plan which will be designed to ensure long term effectiveness of the cover in presenting a barrier between the ground surface and the underlying soil. Remaining risks would be associated with excavation activities which could be conducted at the site (e.g., underground utility repairs). This is addressed in the SMP which will provide the health and safety protocols to be followed for any excavations on the property. It will also provide protocols for any soil disposal and requirements for post-excavation repair/replacement of the cover materials. The SMP is formalized in an environmental easement. Alternative S-3 would be highly effective in attaining the RAOs related to prevention exposure to COCs in site soils. Alternative S-3 would have no significant effect on reducing any continuing source of MGP impacts to groundwater.

Reduction of Toxicity, Mobility, or Volume: Alternative S-3 would reduce toxicity, mobility and volume of contamination by removal of historic fill material and CLM/ALM. Approximately 500 cubic yards (cy) of soil would be removed and properly disposed. The soil removal and placement of cover soil would allow ongoing natural attenuation processes to continue at the site. As such, Alternative S-3 would result in progressively lower concentrations of COCs in soil over time.

Implementability: As indicated above for Alternative S-2, the development and filing of the environmental easement and SMP present no implementability concerns. The construction activities associated with the cover enhancement are straightforward and require no specialized equipment. There are no property access issues or permit approvals required to perform the work. No problems related to implementability of Alternative S-3 are expected.

Compliance with SCGs: Surface and shallow soil removal with placement of cover soil would attain RAOs by eliminating exposure to surface soil and mitigating any exposure to subsurface soil which could be associated with future excavation activities. Chemical-specific SCGs would be met in all cover soils through removal surface and shallow soil and replacement with clean soil. Alternative S-3 would immediately achieve complete compliance with chemical-specific SCGs identified in Table 1A for shallow soil. The SCGs for soil cleanup objectives in deeper soils would not be achieved until natural attenuation processes had reduced concentrations of COCs to the identified levels. Chemical-specific SCGs pertaining to waste characterization are generally applicable to this alternative since it includes removal and disposal. Compliance with these SCGs will be required by the SMP for any future disposal of excavated soil below the soil cover.

Alternative S-3 would comply with potential location-specific SCGs (listed in Table 1B) and would be conducted in accordance with local codes and ordinances.

Action-specific SCGs are listed in Table 1C. For Alternative S-3, relevant action-specific SCGs provide requirements for health and safety of workers and control of dust generation and erosion. Alternative S-3 would comply with action-specific SCGs.

Overall Protection of Human Health and the Environment: With the site restrictions and proper maintenance as would be required by the environmental easement and associated SMP/Cover Maintenance Plan, Alternative S-3 would be protective of human health and the environment. Exposures to impacted soils would be prevented by the soil cover and special procedures for excavation as presented in the SMP.

Alternative S-3 would have no significant effect on reducing any continuing source of MGP impacts to groundwater. However, the RI showed that COCs present in soils at the site have not resulted in off-site impacts to groundwater. Therefore, it is unlikely these soils represent a continuing source of potential off-site groundwater impacts.

Cost: The cost to implement Alternative S-3 is $475,000 as shown in Table 5.

#### *6.2.1.5 Alternative S-4 – Remove Soil Above 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives*

Technical Description: Alternative S-4 entails the excavation and removal of soil containing COCs above Part 375 Unrestricted Use SCOs and, as stated in Section 5.4.1.4, is presented as a NYSDEC requirement. Alternative S-4 is not considered to be practical or reasonable considering: the expansive nature of historic fill that parallels the canal in the Village of Albion (well beyond the site limits); the current and future site use; numerous technical challenges of removing a high volume of soil from a relative small space given the overhead and underground utilities on-site and subsurface structures associated with the lift bridge; and major disruptions to the residential and business community in the Village of Albion. Under this alternative, all of the historic fill material (estimated to include the upper 8 to 10 feet of soil/fill) as well as deeper soils in the area of the western gas holder and impacted soils in the area well MW-8 would be removed and properly disposed. Excavation of deeper soils would extend to an approximate depth of 18 to 20 feet below grade. Specialized construction methods and specifications would be required and would involve designs requiring the installation of sheet pile with bracing and shoring because of the need to excavate to the site boundary, areas adjacent to underground structures near the lift-bridge, and the small site size.

The planning required for this alternative would be extensive given the volume of soil to be removed and disposed. Because deeper excavations would extend below the water table, temporary dewatering of the excavations would be required. This water would be pumped to

on-site storage tanks and sent to a permitted off-site water treatment facility. The design documents for Alternative S-4 would include provisions for community air monitoring, odor control contingencies, vibration monitoring and noise control (during sheeting installation/removal), and public safety and traffic control contingencies.

Clean soils/stone will backfill all excavations performed under this alternative and the ground surface would be graded and seeded as appropriate.

This alternative would not require implementation of an SMP since surface and shallow soils containing COCs above SCOs would be removed. No environmental easements or deed restrictions pertaining to environmental conditions at the site would be needed. Most of the soil removed for this alternative would be historic fill materials unrelated to the past MGP activities.

Short-Term Effectiveness: Alternative S-4 entails excavation of 2,200 cy of soil for off-site disposal. There would be substantial short term considerations associated with open excavations, stockpiling and/or loading of impacted materials and transport of haul trucks to and from the site.

The likely excavation limits for Alternative S-4 are shown on Figure 11. The excavation areas would extend to the sidewalk adjacent to Ingersoll Street and off-site properties to the south and off-site property associated with the NYS Erie Barge Canal walking trail. Sheeting would be driven around the site perimeter to facilitate excavating soil to a depth of 10 feet at the property boundary. Noise and vibration concerns would be monitored during installation and would impact residential life quality and business operations on East Bank Street. Odors from the excavation and stockpiles could be noticeable to persons walking or driving on Ingersoll Street. The planning and design for Alternative S-4 would therefore include a community air monitoring plan with provisions for odor controls as necessary. Implementation of a vibration monitoring/loss control plan would also be needed during sheeting installation/removal. It may be necessary to close Ingersoll Street and canal walking path to pedestrian and vehicle traffic during work activities.

The excavation areas shown on Figure 11 would be excavated in their entirety, there would be no attempt to segregate impacted soil from less impacted soil and would include all of the on-site historic fill material. All excavated soil would be transported off-site for proper disposal. This would limit the extent of soil handling and reduce the potential for odors and dust generation. In addition, if practical, excavated soils could be loaded directly into trucks without stockpiling. This would also minimize odors and logistical issues associated with soil handling

and stockpiling. However, this “load and go” strategy requires staging of trucks on-site or nearby to minimize excavation downtime.

It is estimated that the excavations could be completed over a two month period following installation of sheeting (estimated three weeks). A total of approximately 2,200 cy representing 150 to 200 truck loads. This would pose a significant short term increase in truck traffic in the vicinity of the site. Staging of the trucks represents a challenge as there may not be room on Ingersoll Street. Truck traffic and staging will result in community disruption and inconvenience to nearby residents and businesses located along Ingersoll and East Bank Streets. Logistics issues associated with Alternative S-4 are far more complex than for any of the other alternatives.

Fossil fuel use and emissions (including greenhouse gas emissions) would be more significant for Alternative S-4 than for the other alternatives evaluated.

After construction and backfilling with clean soils, Alternative 4 would be immediately effective in attaining the RAOs.

Long-Term Effectiveness: Alternative S-4 would be highly effective in meeting project RAOs without any post-construction maintenance or institutional controls.

Reduction of Toxicity, Mobility, or Volume: Alternative S-4 would reduce the volume of MGP and historic fill impacts at the site through removal and off-site disposal at a permitted facility. Alternative S-4 would remove approximately 2200 cy of soil which is primarily impacted by the presence of historic fill. It would not be feasible to remove the small, localized area of NAPL ganglia present in the upper till at SUPP-B-3 because of the proximity to subsurface structures and utilities that exist in the northeast corner of the property adjacent the lift bridge control tower and lift pit. Therefore, it is unlikely that all impacted soil could be feasibly removed from the site.

Implementability: Implementation of the excavations and off-site disposal poses major concerns. As indicated above, special excavation procedures (sheet pile installation) will be required for excavating soil at the site boundaries and in the area of deeper excavations near well MW-8 on the eastern side of the site. Dewatering would also be required since excavations would extend below the water table. Removing the upper 8 to 10 feet of historic fill and soil would require careful excavation and shoring of the natural gas pipeline that traverses the property and removal and replacement of the on-site storm sewer.

Truck staging and traffic represents a major concern with respect to community disruption and safety. Planning to stage and manage the truck traffic will be extensive and require community input.

Compliance with SCGs: Alternative S-4 would comply with all applicable chemical specific, action specific, and location specific SCGs identified in Tables 1A, 1B, and 1C and would include the need to obtain permits with the NYS Thruway Authority since work activities (fencing, equipment storage) would likely occur on off-site property areas adjacent to the canal.

Overall Protection of Human Health and the Environment: Alternative S-4 would be protective of human health and the environment. Exposures to impacted soils would be eliminated by replacing all MGP impacted and historic fill impacted soils with clean backfill.

However, Alternative S-4 would provide additional environmental benefit relative to Alternative S-3 only if the excavations reduce the source of potential impacts to groundwater. This would only be the case if the MGP and historic fill impacted materials contain elevated concentrations of mobile COCs. As previously described, it would not be feasible to remove the small, localized area of NAPL ganglia present in the upper till at SUPP-B-3 because of the proximity to subsurface structures and utilities that exist in the northeast corner of the property adjacent the lift bridge control tower and lift pit. Based on the RI results, COCs present in soils at the site have not resulted in off-site impacts to groundwater. Therefore, it is unlikely these soils represent a continuing source of mobile COCs. Excavation of these MGP and historic fill impacted soils to achieve Part 375 Unrestricted Use SCOs provide little or inconsequential environmental benefit.

Alternative S-4 would consume a significant resource (soil) in that it would require excavation of soil from a Greenfield location and transporting it to the site. It also would also utilize off-site landfill space.

Cost: The estimated cost to implement Alternative S-5 is approximately $2,100,000 as shown in Table 6.

### 6.3.2 Groundwater Remedial Alternatives

#### *6.3.2.1 Alternative GW-1 – No Further Action*

Technical Description: Under this alternative, no active groundwater remediation activities would be conducted.

Short-Term Effectiveness: Since impacted groundwater has not migrated off-site and is not used on-site or by local residents and commercial businesses (water is municipally provided to the village), over the short term this alternative may be considered protective of the public and the environment.

Long-Term Effectiveness: Lacking institutional controls, GW-1 would not prevent future exposure to COCs in on-site groundwater. With respect to off-site conditions, impacted groundwater has not migrated off-site and is not used by local residents or commercial businesses. Therefore the no further action alternative could be effective in protecting off-site groundwater. However, its long term effectiveness depends solely on natural attenuation processes to maintain a stable or receding plume of COC impacted groundwater. Given the age of the release (more than 70 years), and the results of the RI showing a limited plume which has not migrated off-site, it is likely that the plume is stable or receding. However, there would be no means of demonstrating this without an ongoing groundwater monitoring program which is not included in this Alternative. Therefore the long term effectiveness of the no further action alternative in protecting off-site groundwater is considered questionable.

Reduction of Toxicity, Mobility, or Volume: Alternative GW-1 would reduce toxicity, mobility or volume of contamination as a result of the ongoing natural attenuation processes at the site.

Implementability: There are no implementability concerns with Alternative GW-1.

Compliance with SCGs: Natural attenuation processes may eventually attain chemical specific SCGs at the site. If the plume is stable or receding, natural attenuation processes would continue to prevent off-site exceedance of SCGs.

Overall Protection of Human Health and the Environment: The no further action alternative for groundwater may be protective of human health and the environment. It appears based on the RI and age of the release (greater than 70 years) that the groundwater COC plume is no longer expanding and has reached the stable or receding phase. While this condition is likely, it is subject to some uncertainty. In the absence of long term groundwater monitoring for COCs and natural attenuation indicator parameters, Alternative GW-1 cannot be considered protective of human health and the environment.

There is a second deficiency with GW-1 -- there would be no institutional controls placed to prevent on-site usage of groundwater. While on-site use of groundwater is unlikely given the current and foreseeable uses of the site and the availability of public water, there should be a formal restriction on shallow groundwater use at the site as long as the applicable chemical specific SCGs are exceeded.

Cost: There are no costs associated with GW-1.

#### *6.3.2.2 Alternative GW-2 – Institutional Controls*

Technical Description: This alternative would require the implementation of institutional controls in the form of governmental, proprietary, enforcement, or permit controls to restrict groundwater usage in potentially impacted water-bearing zones. In addition, procedures to control and prevent exposure during any future excavations below the water table would be included in the easement or SMP as appropriate.

Short-Term Effectiveness: On-site use of impacted groundwater would be prohibited by institutional controls. Impacted groundwater has not migrated off-site and is not used on-site by local residents and commercial businesses. Therefore, over the short term this alternative is to be considered protective of the public and the environment.

Long-Term Effectiveness: Institutional controls incorporated into Alternative GW-2 would prevent exposure to COCs in on-site groundwater. Impacted groundwater has not migrated off-site and is not used by local residents or commercial businesses. Therefore Alternative GW-2 could be effective in protecting off-site groundwater. However, its long term effectiveness depends solely on natural attenuation processes to maintain a stable or receding plume of COC impacted groundwater. As described above, it is likely that the plume is stable or receding. However, there would be no means of demonstrating this without an ongoing groundwater monitoring program which is not included in this Alternative. Therefore the long term effectiveness of Alternative GW-2 in protecting off-site groundwater is considered questionable.

Reduction of Toxicity, Mobility, or Volume: Alternative GW-2 would reduce toxicity, mobility or volume of contamination as a result of the ongoing natural attenuation processes at the site.

Implementability: The environmental easements restricting on-site use of impacted groundwater would be subject to legal review and follow the necessary legal process in the State of New York. However, these controls are commonly required for remediated sites in New York and present no implementability concerns.

Compliance with SCGs: Natural attenuation processes may eventually attain chemical specific SCGs at the site. If the plume is stable or receding, natural attenuation processes would continue to prevent off-site exceedance of SCGs.

Overall Protection of Human Health and the Environment: Alternative GW-2 may be protective of human health and the environment with respect to potential exposure to impacted

groundwater. As discussed above, the data developed for the RI is indicative of a COC plume which is no longer expanding and has reached a stable or receding phase. While this condition is likely based on the existing data, it is subject to some uncertainty. In the absence of long term groundwater monitoring for COCs and natural attenuation indicator parameters, Alternative GW-2 cannot be considered fully protective of human health and the environment.

Cost: The estimated cost for preparation and filing of the institutional controls is $30,000 (Table 7).

#### *6.3.2.3 Alternative GW-3 – Monitored Natural Attenuation*

Technical Description: Alternative GW-3 relies on naturally occurring chemical, biological, and/or physical processes to degrade MGP related COCs in groundwater. It includes a groundwater monitoring program designed to demonstrate continued stability of the plume, detect off-site migration and monitor the concentrations of COCs and natural attenuation parameters. It is anticipated that two additional monitoring wells would be installed to improve downgradient groundwater monitoring. Monitoring results indicating significant plume expansion or off-site migration would require re-evaluation of the potential for off-site risks. If appropriate based on identified risks, additional remedial action would be evaluated, including re-evaluation of technologies listed in Section 5.2 if appropriate.

Institutional controls as described above for Alternative GW-2 would also be included in Alternative GW-3.

Short-Term Effectiveness: On-site use of impacted groundwater would be prohibited by institutional controls. Impacted groundwater has not migrated off-site and is not used on-site by local residents and commercial businesses. Therefore, over the short term this alternative is considered protective of the public and the environment.

Long-Term Effectiveness: Institutional controls incorporated into Alternative GW-3 would prevent exposure to COCs in on-site groundwater. Impacted groundwater has not migrated off-site and is not used by local residents or commercial businesses. Therefore Alternative GW-3 would be effective in protecting off-site groundwater. Its long term effectiveness depends on natural attenuation processes to reduce concentrations of COCs in groundwater and prevent plume expansion. Alternative GW-3 includes an ongoing groundwater monitoring program designed specifically to demonstrate and monitor the natural attenuation process and provide early warning of plume expansion. Alternative GW-3 provides for contingent evaluation and implementation of supplemental remedial actions if deficiencies in the MNA program represent an unacceptable public health risk. Therefore Alternative GW-3 is considered to be effective in protecting off-site groundwater.

Reduction of Toxicity, Mobility, or Volume: Alternative GW-3 would reduce toxicity, mobility or volume of contamination as a result of the ongoing natural attenuation processes at the site. These reductions would be demonstrated by the groundwater monitoring program.

Implementability: There are no implementability concerns associated with the environmental easements restricting on-site use of impacted groundwater, installation of additional monitoring wells or conduct of the MNA groundwater monitoring program.

Compliance with SCGs: Natural attenuation processes may eventually attain chemical specific SCGs at the site. Off-site, SCGs for BTEX and naphthalene are met. On-site reduction of COC concentrations in groundwater through natural attenuation processes would continue to prevent off-site exceedance of SCGs. Monitoring well installations and groundwater sampling would be conducted in accordance with action specific SCGs.

Overall Protection of Human Health and the Environment: Alternative GW-3 would protect human health and the environment from exposure to impacted groundwater. Institutional controls would prevent on-site groundwater use and minimize any exposure during future excavation activities. As discussed above, the data developed for the RI is indicative of a COC plume where on-site plume expansion has not occurred and BTEX and naphthalene have not been detected above groundwater standards in off-site wells. The MNA groundwater monitoring program associated with Alternative GW-3 would serve to confirm the longer-term protection of human health and the environment with respect to potential exposure to impacted groundwater. Alternative GW-3 is therefore considered to be protective of human health and the environment with respect to potential exposure to impacted groundwater.

Cost: The estimated cost for implementation of Alternative GW-3 is $250,000 (Table 8).

#### *6.3.2.4 Alternative GW-4 – Enhanced Monitored Natural Attenuation*

Technical Description: Alternative GW-4 is similar to GW-3 except that the natural attenuation process would be enhanced by artificially stimulating bioremediation. This alternative would utilize oxygen-releasing compounds (ORC) and/or other amendments (e.g., nutrients) to stimulate the natural biological processes that degrade dissolved MGP related constituents in on-site groundwater. ORC and amendments would be delivered through vertical wells installed in the area of well MW-5 and MW-8. By stimulating microbiological activity, the reduction in concentrations of COCs in groundwater can be accelerated relative to that achievable under entirely natural conditions (e.g., Alternative GW-3).

Alternative GW-4 includes a groundwater monitoring program designed to demonstrate continued stability of the plume, detect off-site migration and monitor the concentrations of

COCs and natural attenuation parameters. It is anticipated that two additional monitoring wells would be added to monitor downgradient groundwater quality. Monitoring results indicating significant plume expansion or off-site migration would require re-evaluation of the potential for off-site risks. If appropriate based on identified risks, additional remedial action would be evaluated, including re-evaluation of technologies listed in Section 5.2 if appropriate.

Institutional controls as described above for Alternative GW-2 would also be included in Alternative GW-4.

Short-Term Effectiveness: On-site use of impacted groundwater would be prohibited by institutional controls. Impacted groundwater has not migrated off-site and is not used on-site by local residents and commercial businesses. Therefore, over the short term this alternative is considered protective of the public and the environment.

Long-Term Effectiveness: Institutional controls incorporated into Alternative GW-4 would prevent exposure to COCs in on-site groundwater. Impacted groundwater has not migrated off-site and is not used by local residents or commercial businesses. Therefore Alternative GW-4 could be effective in protecting off-site groundwater. Its long term effectiveness depends on degree to which the stimulated natural attenuation processes maintain a stable or receding plume of COC impacted groundwater. As described above, RI findings indicate COC concentrations have not increased and plume expansion is not occurring under current conditions. However, if the rate of COC reduction through natural attenuation has slowed to asymptotic levels, the enhanced MNA process included in Alternative GW-4 may be successful in increasing the rate of COC degradation.

Alternative GW-4 includes an ongoing groundwater monitoring program designed specifically to demonstrate and monitor the natural attenuation process and provide early warning of plume expansion. Alternative GW-4 provides for contingent evaluation and implementation of supplemental remedial actions if deficiencies in the MNA program represent an unacceptable public health risk. Therefore Alternative GW-4 is considered to be effective in protecting off-site groundwater.

Reduction of Toxicity, Mobility, or Volume: Alternative GW-3 would reduce toxicity, mobility or volume of contamination as a result of the stimulated natural attenuation processes at the site. The reductions would be more rapid than for the alternatives relying on un-enhanced natural attenuation processes. These reductions would be demonstrated by the groundwater monitoring program.

Implementability: There are no implementability concerns associated with the environmental easements restricting on-site use of impacted groundwater, installation of additional monitoring wells or conduct of the MNA groundwater monitoring program. ORC and amendments used to stimulate the natural attenuation are non-toxic and permitted for controlled use by the NYSDEC.

Compliance with SCGs: The stimulated natural attenuation processes may eventually attain chemical specific SCGs at the site. If the plume is stable or receding, the stimulated natural attenuation processes would continue to prevent off-site exceedance of SCGs. Monitoring well installations, groundwater sampling and the use of ORC/amendments would be conducted in accordance with action specific SCGs.

Overall Protection of Human Health and the Environment: Alternative GW-4 would protect human health and the environment from exposure to impacted groundwater. Institutional controls would prevent on-site groundwater use and minimize any exposure during future excavation activities. As discussed above, the data developed for the RI is indicative of a COC plume where on-site plume expansion has not occurred and BTEX and naphthalene have not been detected above groundwater standards in off-site wells. The MNA groundwater monitoring program associated with Alternative GW-4 would serve to confirm the longer-term protection of human health and the environment with respect to potential exposure to impacted groundwater. However, if the rate of COC reduction through natural attenuation has slowed to asymptotic levels, enhanced MNA process included in Alternative GW-4 may be successful in increasing the rate of COC degradation. Alternative GW-3 is therefore considered to be protective of human health and the environment with respect to potential exposure to impacted groundwater.

Cost: The estimated cost to implement Alternative GW-4 is approximately $600,000 (Table 9).

# 7.0 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

## 7.1 SOIL REMEDIATION ALTERNATIVES

Four soil remediation alternatives were evaluated in Section 6.0:

- S-1 No Further Action
- S-2 Institutional Controls
- S-3 Limited Surface/Shallow Soil Removal and Soil Cover Installation
- S-4 Remove Soil above 6NYCRR Part 375 Unrestricted Use SCOs

These alternatives are compared below.

Short-Term Effectiveness: Alternatives S-1 and S-2 would both be effective over the short term since the existing cover prevents exposure to site soils and these alternatives do not involve any construction activities. Since construction activities associated with Alternative S-3 are straightforward and would uncover a limited amount of impacted soil during CLM/ALM removal, this alternative is considered as equally as effective over the short term as Alternatives S-1 and S-2.

Based on the smaller volumes of soil excavation and transportation and disposal of impacted soil, fossil fuel use and emissions (including greenhouse gas emissions) associated with implementation of Alternative S-3 would be far lower than for Alternative S-4. For Alternative S-3, the logistical issues associated the loading of 40 to 50 trucks over the course of approximately three weeks would be manageable with adequate advance planning. The limited area of the excavations would allow for some space on the site to be used for equipment and water storage, soil management and some limited staging of trucks. Short term nuisance issues associated with traffic, noise and odors could be minimized.

Alternative S-4 presents short term concerns associated with the uncovering and handling of impacted soils. It would also involve some degree of community disruption including closing of the canal walking path and Ingersoll Street to pedestrian traffic and temporary closing of Ingersoll Street to vehicular traffic to accommodate the truck traffic required to implement the alternative. Rather than managing 40 to 50 trucks as in Alternative S-3, Alternative S-4 would require management of up to 300 trucks on a site that would be nearly entirely excavated. Short term nuisance issues associated with traffic, off-site staging of trucks, vibration (during sheet pile installation), noise and odors would be unavoidable and would last as long as three months. The short-term impacts associated with S-4 are not considered to be manageable and would result in significant community disruption.

Long-Term Effectiveness: As discussed in Section 6.2, Alternative S-1 cannot be considered to be effective over the long term. The long term effectiveness of Alternative S-2 is compromised by the lack of a cover maintenance program. Alternatives S-3 and S-4 are generally equally effective in minimizing exposure to COCs, in site soils but short-term impacts of implementing S-4 are overwhelmingly greater than impacts from S-3.

Reduction of Toxicity, Mobility, or Volume: Alternatives S-3 and to a greater extent S-4, would reduce the volume of historic fill and MGP impacts at the site through removal and off-site disposal at a permitted facility. S-4 could not feasibly remove all MGP impacted soil from the site. Alternatives S-1 and S-2 would not immediately reduce toxicity, mobility or volume of contamination except as results from the ongoing natural attenuation processes at the site.

Compliance with SCGs: All soil alternatives evaluated generally comply with applicable location specific and action specific SCGs listed in Tables 1B and 1C. Alternatives S-1and S-2 would not meet chemical-specific SCGs until natural attenuation processes had reduced concentrations of COCs to the identified levels, which would not be expected to occur over a reasonable timeframe. Alternative S-3 would achieve chemical-specific SCGs in surface and shallow soil but would rely on natural attenuation processes to reduce COC concentrations to meet SCGs in deeper soil. Chemical-specific SCGs pertaining to waste characterization would be met for all soils to be disposed off-site. Alternative S-4 would comply with chemical specific SCGs by removing all historic fill and deeper soil but is not a practicable alternative for this small site.

Overall Protection of Human Health and the Environment: Alternatives S-1 and S-2 are both inadequate with respect to long term protection of human health and the environment. With the site restrictions and proper maintenance as would be required by the environmental easement and associated SMP/Cover Maintenance Plan, Alternative S-3 would be protective of human health and the environment. S-3 removes CLM/ALM present in on-site historic fill. Exposures to deeper impacted soils would be prevented by the soil cover and special procedures for excavation as presented in the SMP.

With respect to overall protection of human health and the environment, the only potentially substantive benefit associated with Alternative S-4 over Alternative S-3 is the potential for acceleration of the remediation of groundwater as a result of removal of COCs from the saturated zone. The RI showed that COCs present in soils at the site have not resulted in off-site impacts to groundwater. Therefore, it is unlikely these soils represent a continuing source of potential off-site groundwater impacts. The environmental benefit associated with deeper site excavations is therefore marginal. The major difference between Alternatives S-3 and S-4 is that all historic fill is removed as a part of Alternative S-4. This would provide little if any

improvement in protection of human health and the environment and likely would have negligible additional effect on concentrations of COCs in groundwater.

Cost: The estimated costs to implement the soil remediation alternatives are presented below:

| Soil Alternative | Estimated Capital Cost | Estimated O&M Present Worth | Total Estimated Cost |
|---|---|---|---|
| **S-1 - No Further Action** | $0 | $0 | **$0** |
| **S-2 – Institutional Controls** | $42,000 | $96,000 | **$138,00** |
| **S-3 – Limited Surface/Shallow Soil Removal and Soil Cover Installation** | $379,000 | $96,000 | **$475,000** |
| **S-4 – Remove Soil above Part 375 SCOs for Unrestricted Use** | $2,100,000 | $0 | **$2,100,000** |

## 7.2 GROUNDWATER ALTERNATIVES COMPARISON

Four groundwater remediation alternatives were evaluated in Section 6.0:

- Alternative GW-1 – No Further Action
- Alternative GW-2 – Institutional Controls
- Alternative GW-3 – Monitored Natural Attenuation
- Alternative GW-4 – Enhanced Monitored Natural Attenuation

Short-Term Effectiveness: Since impacted groundwater has not migrated off-site and is not used on-site or by local residents and commercial businesses (water is municipally provided to the village), over the short term all four alternatives may be considered protective of the public and the environment.

Long-Term Effectiveness: Lacking institutional controls, GW-1 would not prevent future exposure to COCs in on-site groundwater. Alternative GW-2 provides institutional controls to prevent exposure to COCs in on-site groundwater. Impacted groundwater has not migrated off-site and is not used by local residents or commercial businesses. Therefore Alternative GW-2 could be effective in protecting off-site groundwater. However, its long term effectiveness depends on natural attenuation processes to maintain a stable or receding plume of COC impacted groundwater. As described earlier in this report, the RI indicates COC concentrations have not increased and plume expansion is not occurring. However, there would be no means of demonstrating a reduction of COCs in on-site groundwater

without an ongoing groundwater monitoring program which is not included in this Alternative. Therefore the long term effectiveness of Alternative GW-2 in protecting off-site groundwater is considered less than Alternative GW-3.

Alternative GW-3 includes an ongoing groundwater monitoring program designed specifically to demonstrate and monitor the natural attenuation process. The monitoring program would identify changing environmental conditions that could affect biodegradation processes and characterize the distribution of COCs in groundwater and its effect on plume stability or reduction. Therefore Alternative GW-3 is considered to be effective in protecting off-site groundwater.

Alternative GW-4 may be somewhat more effective than Alternative GW-3 in reducing COC concentrations in on-site groundwater due to the potential acceleration of the natural attenuation processes. However, implementing GW-4 for the purpose of improving off-site groundwater quality would not be necessary since COCs are not detected above standards in off-site groundwater.

Reduction of Toxicity, Mobility, or Volume: All four alternatives would reduce toxicity, mobility or volume of contamination as a result of the ongoing natural attenuation processes at the site. These reductions may be accelerated on-site using the enhanced natural attenuation techniques included in Alternative GW-4.

Implementability: There are no significant implementability concerns with any of the four groundwater remediation alternatives.

Compliance with SCGs: Natural attenuation processes would continue to prevent off-site exceedance of SCGs under all four alternatives. In addition, for all four alternatives the natural attenuation processes may eventually attain chemical specific SCGs at the site. The time required to attain SCGs on-site could be reduced for Alternative GW-4 due to the enhancement of natural attenuation processes.

Overall Protection of Human Health and the Environment: In the absence of long term groundwater monitoring for COCs and natural attenuation indicator parameters in groundwater, Alternatives GW-1 and GW-2 cannot be considered fully protective of human health and the environment. Alternative GW-1 also lacks institutional controls to restrict groundwater use and minimize on-site exposures should excavations below the water table be performed in the future.

Alternative GW-3 would protect human health and the environment from exposure to impacted groundwater. Institutional controls would prevent on-site groundwater use and minimize any exposure during future excavation activities. As discussed above, the RI indicates the plume is no longer expanding and BTEX and naphthalene concentrations in off-site groundwater are below standards. Alternative GW-3 is therefore considered to be protective of human health and the environment with respect to potential exposure to impacted groundwater.

Institutional controls are also incorporated into Alternative GW-4 and would prevent exposure to COCs in on-site groundwater. Impacted groundwater has not migrated off-site and is not used by local residents or commercial businesses. As described above, it is likely that the plume is stable or receding under current conditions. Therefore, there is likely to be no substantial additional protection of human health and the environment associated with the enhanced MNA process (GW-4) compared to the un-enhanced MNA process (GW-3).

Cost: The estimated costs to implement the groundwater remediation alternatives are summarized below:

| Ground Water Alternative | Estimated Capital Cost | Estimated OM&M Present Worth | Total Estimated Cost |
|---|---|---|---|
| **GW-1 No Further Action** | $0 | $0 | **$0** |
| **GW-2 – Institutional Controls** | $30,000 | $0 | **$30,000** |
| **GW-3 – Monitored Natural Attenuation** | $53,000 | $197,000 | **$250,000** |
| **GW-4 – Enhanced Monitored Natural Attenuation** | $165,000 | $431,000 | **$596,000** |

# 8.0 RECOMMENDATION OF PREFERRED ALTERNATIVE

## 8.1 RECOMMENDED SOIL REMEDIAL ALTERNATIVE

Alternatives S-1 and S-2 are both inadequate with respect to long term protection of human health and the environment. Alternatives S-3 and S-4 meet the project RAOs. The removal of impacted soil (S-4) to allow unrestricted site use is not considered a practical alternative considering technical difficulties described in Section 6.2.1.5 and Section 7.1 and significant impact on the residential and business community in the Village of Albion. The only potentially substantive benefit associated with Alternative S-4 over Alternative S-3 is the potential for acceleration of the on-site remediation of groundwater as saturated soil removal. The RI showed that COCs present in soils at the site have not resulted in off-site impacts to groundwater. Therefore, it is unlikely these soils represent a continuing source of potential off-site groundwater impacts. The environmental benefit associated with deeper site excavations is therefore marginal. Alternative S-3 would be similarly effective with far less community disruption. Alternative S-3 includes a demarcation layer to support potential future intrusive worker activities (conducted in accordance with a SMP) by providing an easily recognizable material that separates clean soil from the historic fill.

Alternative S-3 is therefore recommended as the preferred alternative.

## 8.2 RECOMMENDED GROUNDWATER REMEDIAL ALTERNATIVE

Alternatives GW-1 and GW-2 cannot be considered fully protective of human health and the environment. Both Alternatives GW-3 and GW-4 meet project RAOs and would protect human health and the environment from exposure to impacted groundwater. Alternative GW-4 could accelerate the rate of COC attenuation in on-site groundwater, however this would provide little or no net increase in protection of human health and the environment relative to GW-3. Therefore, there is likely to be no substantial additional protection of human health and the environment associated with the enhanced MNA process (GW-4) compared to the un-enhanced MNA process (GW-3).

Alternative GW-3 is therefore recommended as the preferred alternative.

## 9.0 REFERENCES


Brown & Caldwell, 2004. *Supplemental Site Investigation Work Plan*, Albion Former MGP Site, Albion, New York, March 16.

Geomatrix Consultants, Inc. (Geomatrix), 2005. *Supplemental Site Investigation Work Plan*, Albion Former MGP Site, Albion, New York, September 16.

Geomatrix, 2006. *Supplemental Site Investigation Report*, Albion Former MGP Site, Albion, New York, January 5.

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Malcolm Pirnie, Inc. (MPI), 1998. *Preliminary Site Assessment/Interim Remedial Measures (PSA/IRM) Study*, Niagara Mohawk, Albion, New York, July.

Stearns & Wheler (S&W), 1999. *Preliminary Site Assessment/Interim Remedial Measures (PSA/IRM) Work Plan*, Niagara Mohawk, Albion, New York, October.

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S&W, 2001. *Phase II Site Investigation Work Plan*, Niagara Mohawk, Albion, New York, April.

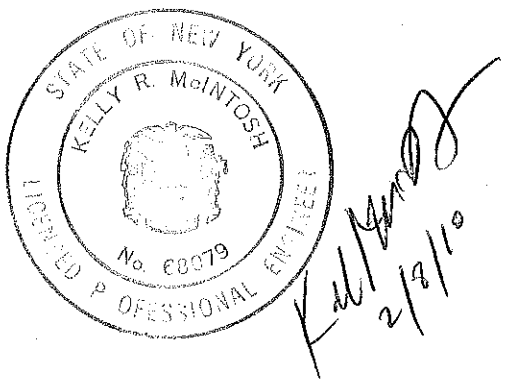
S&W, 2002a. *Phase II Site Investigation*, Albion Former MGP, Niagara Mohawk, Albion, New York, January.

S&W, 2002b. *Remedial Investigation Work Plan*, Niagara Mohawk, Albion, New York, September.

S&W, 2003. *Remedial Investigation*, Niagara Mohawk, Albion Former MGP Site, Albion, New York, November.

## 10.0 CERTIFICATION

This Feasibility Study for the Albion Former MGP Site was prepared by and under the direction of the undersigned in accordance with the multi-site Consent Order (Index No. A4-0473-0000) as referenced in Section 1.0.




Kelly R. McIntosh, Ph.D., P.E.

GEOMATRIX ENGINEERING LLC
AMEC GEOMATRIX INC.

# TABLES

**TABLE 1A**
**POTENTIAL CHEMICAL-SPECIFIC ARARs**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Regulation (Standard or Guidance) | Citation or Reference | Description/Comments |
|---|---|---|
| ***Groundwater:*** | | |
| RCRA Groundwater Protection Standards and Maximum Concentration Limits | 40 CFR 264, Subpart F | Establishes criteria for groundwater consumption. Groundwater is not used for potable purposes. Potentially relevant if an action involves future use of groundwater as a potential supply. |
| NYSDEC Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations | 6NYCRR Parts 701- 703 | Establishes groundwater and surface water quality criteria. Establishes criteria for groundwater consumption. |
| NY Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations | TOGS 1.1.1, June 1998 (April 2000 addendum) | Compilation of ambient water quality standards and guidance values. To be considered. |
| ***Air:*** | | |
| New York State Air Quality Classifications and Standards | 6NYCRR Parts 256 and 257 | Establishes air quality standards protective of public health. Potentially applicable to disruptive activities. |
| National Primary and Secondary Ambient Air Quality Standards (NAAQS) | 40 CFR Part 50 | Establishes primary and secondary ambient air quality standards to protect public health and welfare. Potentially applicable to disruptive activities. |
| ***Soil:*** | | |
| RCRA-Regulated Levels for Toxic Characteristics Leaching Procedure (TCLP) Constituents | 40 CFR Part 261 | Establishes TCLP constituent levels for identification of hazardous wastes that exhibit the characteristic of toxicity. Applicable for soil disposal. |
| Universal Treatment Standards/Land Disposal Restrictions (UTS/LDRs) | 40 CFR Part 268 | Identifies hazardous wastes for which land disposal is restricted and provides a set of numerical constituent concentration criteria at which hazardous wastes is restricted from land use. |
| NYSDEC Determination of Soil Cleanup Objectives and Cleanup Levels | NYSDEC TAGM HWR-94-4046, January 1994 and Dec. 2000 Addendum | Replaced by 6NYCRR Part 375 regulation. Provides a basis and procedures to determine soil cleanup levels, as appropriate, for sites when cleanup to pre-disposal conditions is not possible or feasible. Contains generic soil cleanup objectives. |
| NYSDEC Environmental Remediation Program | 6NYCRR Part 375 | Establishes procedures to determine soil cleanup levels, as appropriate, for sites when cleanup to pre-disposal conditions is not possible or feasible. Contains soil cleanup objectives based on site use. To be considered in the evaluation of soil quality. |

**TABLE 1A (cont.)**
**POTENTIAL CHEMICAL-SPECIFIC ARARs**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Regulation (Standard or Guidance) | Citation or Reference | Description/Comments |
|---|---|---|
| ***Soil (cont.):*** | | |
| NYSDEC Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants ("MGPs") | TAGM #4061 (1/11/02) | Outlines the criteria for conditionally excluding coal tar waste and impacted soils from former MGPs which exhibit the hazardous characteristic of toxicity for benzene (D018) from the hazardous waste requirements of 6 NYCRR Parts 370-374 and 376 when destined for thermal treatment. |
| New York State Identification and Listing of Hazardous Wastes | 6 NYCRR Part 371 | Outlines criteria for determining if a solid waste is a hazardous waste and is subject to regulation under 6 NYCRR Parts 371 – 376. |
| ***Other:*** | | |
| USEPA Integrated Risk Information System (IRIS) | www.epa.gov/iris | Database of human health effects that may result from exposure to various substances found in the environment. |

**TABLE 1B**
**POTENTIAL LOCATION-SPECIFIC ARARs**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Regulation (Standard or Guidance) | Citation or Reference | Description/Comments |
|---|---|---|
| National Historic Preservation Act | 16 CFR Part 470 | Requires avoiding impacts on cultural resources having historical significance. Potentially applicable to remedial alternatives involving construction. |
| Endangered Species Act | 50 CFR Part 402 | Actions must not threaten the continued existence of a listed species nor destroy critical habitat. Potentially applicable to remedial alternatives involving construction. |
| NYS Thruway Authority Revocable Permits for Canal System | 21 NYCRR Part 156 | Requires a permit to allow temporary use of canal lands or facilities. Potentially applicable to remedial activities that may occur on land adjacent to the Erie Barge Canal. |

**TABLE 1C**
**POTENTIAL ACTION-SPECIFIC ARARs**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Regulation (Standard or Guidance) | Citation or Reference | Description/Comments |
|---|---|---|
| ***Groundwater:*** | | |
| Clean Water Act, National Pretreatment Standards | 40 CFR 403.5 | General pretreatment regulations for discharge to POTWs – potentially applicable for alternatives involving discharges to sanitary sewer. |
| Discharges to Public Waters | New York State Environmental Conservation Law, Section 71-3503 | Law not allowing deposition of gas tar, or the refuse of a gas house or gas factory, or offal, refuse, or any other noxious, offensive, or poisonous substances into any public waters, or into any sewer or stream running or entering into such public waters. |
| New York State Pollution Discharge Elimination System (SPDES) | 6 NYCRR Parts 750 – 758 | These regulations detail the permit requirements for the discharge of pollutants to the water of New York State. |
| ***Air:*** | | |
| National Emission Standards for Hazardous Air Pollutants (NESHAPs) | 40 CFR Part 61 | Standards by which owners/operators emitting HAPs must abide. Potentially applicable to alternatives involving air emissions. |
| Clean Air Act Section 101, Approval and Promulgation of Implementation Plan | 40 CFR Parts 52 and 60 | Requires development of a fugitive and odor emission control plan for implementation during excavation and consolidation actions. Potentially applicable to waste fill remediation alternatives. |
| NYSDEC Guidance for Fugitive Dust Suppression and Particulate Monitoring at Inactive Hazardous Waste Sites. | NYSDEC TAGM 4031 | Establishes guidance for community air monitoring and controls to monitor and mitigate fugitive dusts during intrusive activities at NY State inactive hazardous waste sites – to be considered for disruptive activities. |
| NY State Air Regulations – General Provisions and General Prohibitions | 6NYCRR Parts 200 and 211 | Part 201 requires owners of sources to restrict emissions. Part 211 prohibits air emissions that are injurious to humans, plants, animals or property, or which unreasonably interfere with the comfortable enjoyment of life or property. Potentially applicable to alts. involving air emissions. |
| NY State Air Permits and Certifications | 6NYCRR Part 201 | Requires owners and/or operators of air contamination sources to obtain a permit or registration certificate. Potentially applicable to alternatives involving air emissions |
| NYSDEC Division of Air Resources - Guidelines for the Control of Toxic Ambient Air Contaminants | NYSDEC DAR-1, December 2003 (formerly Air Guide 1) | Establishes process emissions guidance limits based on assumed diffusion rates and inhalation by downwind receptor. To be considered for remedial activities having process emissions. |
| OSHA General Industry Air Contaminants Standard | 29 CFR 1910.1000 | Establishes Permissible Exposure Limits for workers exposed to airborne contaminants. Applicable to disruptive activities. |

**TABLE 1C (cont.)**
**POTENTIAL ACTION-SPECIFIC ARARs**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Regulation (Standard or Guidance) | Citation or Reference | Description/Comments |
|---|---|---|
| ***Solid, Hazardous, and Non-Hazardous Waste:*** | | |
| NYSDEC Inactive Hazardous Waste Disposal Sites | 6NYCRR Part 375 | Establishes procedures for inactive hazardous waste disposal site identification, classification, and investigation activities, as well as remedy selection and interim remedial actions. To be considered. |
| NY State Solid Waste Transfer Permits | 6NYCRR Part 364 | Establishes procedures to protect the environment from mishandling and mismanagement of all regulated waste transported from a site of generation to the site of ultimate treatment, storage, or disposal. Potentially applicable for alternatives involving off-site disposal. |
| Criteria for Municipal Solid Waste Landfills | 40 CFR Part 258 | Establishes minimum national criteria under the RCRA for all municipal solid waste landfill (MSWLF) units and under the Clean Water Act for solid waste landfills that are used to dispose of impacted soil. |
| NYSDEC Technical and Administrative Guidance Memorandums (TAGMs) | NYSDEC TAGMs | TAGMs are NYSDEC guidance that are to be considered during the remedial process. |
| Proposed Requirements for Hybrid Closures | 52 Federal Register 8711 | Combined waste-in-place and clean closures. To be considered. |
| Management of Soil and Sediment Contaminated with Coal Tar from Former Manufactured Gas Plants | NYSDEC Program Policy | Purpose of the guidance is to facilitate the permanent treatment of soil impacted with coal tar from the sites of former MGPs. |
| DOT Rules for Hazardous Materials Transport | (49 CFR 107, 171.1 - 171.5). | Establishes requirements for shipping of hazardous materials. Potentially applicable for alternatives involving off-site disposal |
| Occupational Safety and Health Act (29 USC 651 *et seq.*) | 29 CFR Part 1910 and 1926 | Describes procedures for maintaining worker safety. Applicable to site construction activities. |
| ***Other:*** | | |
| CERCLA/SARA/NCP | (40 CFR Part 300) | Provides foundation for federal hazardous waste/hazardous material regulations. Applicable to remedial alternative selection. |
| USEPA Policy on Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites | OSWER Directive 9200.4-17p, April 1999 | Clarifies USEPA's policy regarding the use of monitored natural attenuation for the cleanup of contaminated soil and groundwater. To be considered. |

**TABLE 2**
**SUMMARY OF TECHNOLOGY SCREENING FOR SOIL**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Response Action | Technology | Effectiveness | Implementability | Cost | Status of Alternative Development |
|---|---|---|---|---|---|
| No Further Action | No Further Action – No active remedial action. | May not achieve RAOs for eliminating or reducing contact with or ingestion soil. | Implementable | Low | Retained |
| Institutional Controls | Deed restrictions, enforcement and permit controls, Soils Handling & Management Plans | Effective in achieving RAO for eliminating or reducing contact with or ingestion of soil. | Implementable | Low | Retained |
| In-Situ Containment/Barrier | Surface Barrier – Soil and Crushed Stone | Effective in achieving RAO for eliminating or reducing contact with or ingestion of soil. | Implementable | Low | Retained |
| | Surface Barrier – Engineered Cap (asphalt, concrete, clay/soil and geomembrane cover) | Effective in achieving ROA for eliminating or reducing contact with or ingestion of soil. An engineered cap would increase height of ground surface at the site and could pose surface water drainage issue. | Implementable | Moderate capital and O&M costs | Not Retained |
| | Slurry Wall, Sheet Piles | Technology is effective in containing of-site movement of MGP constituents. Since off-site transport has not occurred, this technology would not be appropriate. Does not reduce contaminant volume. | Implementable | High capital, low O&M cost | Not Retained |
| | Solidification/Stabilization | Mixing chemical reagents in to the subsurface to stabilize MGP related constituents. Treatability testing would be required to test effectiveness. Does not reduce contaminant volume. | Potentially implementable. Presence of underground utilities and structures would hinder technology use. | High capital, low O&M cost | Not Retained |

**TABLE 2**
**SUMMARY OF TECHNOLOGY SCREENING FOR SOIL**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Response Action | Technology | Effectiveness | Implementability | Cost | Status of Alternative Development |
|---|---|---|---|---|---|
| In-Situ Treatment | Chemical Oxidation | Oxidizing agents added to reduce mass of MGP related constituents. A pilot study is required to assess effectiveness | Potentially implementable. However, delivery of agents would be hindered by underground utilities and structures. | High capital, high O&M cost | Not Retained |
| | Surfactant/Cosolvent Flushing | Ineffective in low permeability soils where flushing fluids cannot reach all impacted areas. Not effective in unsaturated zone where PAHs co-exist with ALM/CLM. | Implementable. Delivery of flushing fluids would be hindered by underground utilities and structures | High capital, high O&M cost | Not Retained |
| | Dynamic Underground Stripping (steam injection/recovery) | Effectiveness is unknown and would require pilot scale study. | Potentially implementable. Small size of site and underground utilities and above ground structures would hinder implementation | High capital, high O&M cost | Not Retained |
| Removal | Excavation | Effective in elimination of exposure pathway via direct contact and ingestion and provides long-term protection of human health. | Implementable. However, subsurface utilities and structures associated with the Lift Bridge would pose a significant challenge to deeper excavations give the small site size. | Moderate to high capital, low O&M cost | Retained |

**TABLE 3**
**SUMMARY OF TECHNOLOGY SCREENING FOR GROUNDWATER**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Response Action | Technology | Effectiveness | Implementability | Cost | Status of Alternative Development |
|---|---|---|---|---|---|
| No Further Action | No Further Action – No active remedial action. | Time frames to achieve groundwater standards may not be practical. | Implementable | Low | Retained |
| Institutional Controls | Deed restrictions, enforcement and permit controls, Soils Handling & Groundwater Management Plans | Would be effective in reducing potential exposure by underground utility construction workers; however, time frames to achieve groundwater standards may not be practical without souce removal. | Implementable | Low | Retained |
| In-Situ Containment/Hydraulic Control | Slurry Wall with Low Rate Groundwater Recovery and On-Site or Off-Site Treatment | MGP-related groundwater impacts have not migrated off-site and additional containment is not necessary. Would be somewhat effective in removing contaminant mass. | Implementable | High capital cost and O&M cost especially if on-site treatment is needed. | Not Retained |
| | Groundwater Recovery with vertical pumping wells or horizontal drains (trenches) | MGP-related groundwater impacts have not migrated off-site and additional containment is not necessary. Would be somewhat effective in removing contaminant mass. | Implementable | High capital cost and O&M cost especially if on-site treatment is needed. | Not Retained |

**TABLE 3**
**SUMMARY OF TECHNOLOGY SCREENING FOR GROUNDWATER**
**ALBION FORMER MGP SITE**
**FEASIBILITY STUDY**

| Response Action | Technology | Effectiveness | Implementability | Cost | Status of Alternative Development |
|---|---|---|---|---|---|
| In-Situ Treatment | Chemical Oxidation | Oxidizing agents added to reduce dissolved and non-aqueous phase MGP related constituents. A pilot study is required to assess effectiveness | Potentially implementable. However, delivery of agents would be hindered by underground utilities and structures. | High capital, high O&M cost | Not Retained |
| | Monitored Natural Attenuation (MNA) | Natural attenuation processes occur at the site and are currently effective in limiting off-site migration. Time frames to achieve groundwater standards may be reduced if used in conjunction with source removal. | Implementable. Monitoring is required to demonstrate performance. | Low capital and low to moderate O&M cost | Retained |
| | Enhanced MNA | Amendments used to enhance documented natural attenuation processes. Time frames to achieve groundwater standards may be reduced if used in conjunction with source removal. | Implementable. Monitoring is required to demonstrate performance. | Low capital and low to moderate O&M cost | Retained |
| Removal | Pump and Treat using horizontal wells and vertical pumping wells | Pump and treat to remove chemical mass requires very long time frames and are even longer time is needed if source material is present. The effectiveness of this technology would be low at this site. | Implementable but small size of site hinders on-site treatment. | High capital and very high O&M cost | Not Retained |

**Table 4**

**Cost Estimate for Alternative S-2 - Institutional Controls**
**Albion Former MGP Site**
**Feasibility Study**

| Item | Quantity | Units | Unit Cost | Total Cost |
|---|---|---|---|---|
| **Capital Costs:** | | | | |
| Institutional Controls (legal suport for deed restrictions, administrative controls) | 1 | LS | $ 25,000 | $ 25,000 |
| Development of Site Management Plan (SMP) | 1 | LS | $ 5,000 | $ 5,000 |
| ***Subtotal:*** | | | | **$ 30,000** |
| Subtotal Capital Cost | | | | $ 30,000 |
| Engineering (15%) | | | | $ 4,500 |
| Contingency (25%) | | | | $ 7,500 |
| | | | **Total Capital Cost:** | **$ 42,000** |
| **Annual Operation Maintenance:** | | | | |
| Inspection/Reporting/Contractor Oversight for Repairs | 1 | LS | $ 5,000 | $ 5,000 |
| Annual Maintenance: | 1 | LS | $ 2,000 | $ 2,000 |
| **Total Annual OM&M Cost** | | | | **$ 7,000** |
| Number of years ( n ): | | | | 30 |
| Interest rate ( I ): | | | | 6% |
| p/A value: | | | | 13.7648 |
| | | | **30 year O&M Present Worth (PW):** | **$ 96,354** |
| **Total Present Worth (PW 30 year):** ***Capital Cost + O&M*** | | | | **$ 138,354** |

NOTES:

1 *Assumes operation and maintenance includes, inspections, reporting, monthly mowing, once annually providing oversight of a construction or utility worker implementing the SMP*

2 *Assumes annual maintenance minor crushed stone additions, storm sewer cleanout, re-seed bare patches.*

**Table 5**

**Cost Estimate for Alternative S-3 - Limited Surface/Shallow Soil Removal and Cover Soil Installation**
**Albion Former MGP Site**
**Feasibility Study**

| Item | Quantity | Units | Unit Cost | Total Cost |
|---|---|---|---|---|
| **Capital Costs:** | | | | |
| Mobillization/Demobilization (equipment staging, decon) | 1 | LS | $ 20,000 | $ 20,000 |
| Temporary Fencing during Construction | 380 | LF | $ 37 | $ 14,060 |
| Health and Safety Air Monitoring | 1 | LS | $ 20,000 | $ 20,000 |
| Erosion Control/Utility Demarcation | 1 | LS | $ 10,000 | $ 10,000 |
| *Remove Surface and Shallow Soil:* | | | | |
| Demo concrete pad and around control tower | 1 | LS | $ 1,200 | $ 1,200 |
| Soil Excavation | 520 | CY | $ 35 | $ 18,200 |
| Remove and Replace Shallow Storm Sewer Piping with Bedding | 25 | LF | $ 80 | $ 2,000 |
| Geotextile demarcation layer across excavation base | 7,000 | SF | $ 0.25 | $ 1,750 |
| Clean Backfill Placement and Compaction | 400 | CY | $ 30 | $ 12,000 |
| Waste Characterization | 1 | LS | $ 1,000 | $ 1,000 |
| Solid Waste Transporation and Disposal | 905 | Ton | $ 75 | $ 67,860 |
| Odor Control/Dust Control | 1 | LS | $ 8,000 | $ 8,000 |
| Construction Oversight | 30 | day | $ 1,500 | $ 45,000 |
| Site Survey (pre- and post restoration, excavation limits) | 1 | LS | $ 8,000 | $ 8,000 |
| *Restoration:* | | | | |
| Replace Concrete Side Walk and Concrete Pad at Tower | 1 | LS | $ 12,000 | $ 12,000 |
| Deliver, Place Top Soil (6-inches) | 0.25 | acre | 25,000 | $ 6,250 |
| Hydro Seed | 0.25 | acre | $ 5,000 | $ 1,250 |
| Crushed Stone Drive | 40 | CY | $ 50 | $ 2,000 |
| Construction Closeout Report | 1 | LS | $ 20,000 | $ 20,000 |
| Institutional Controls/SMP/Cover Maintenance Plan | 1 | LS | $ 35,000 | $ 35,000 |
| ***Subtotal:*** | | | | **$ 270,570** |
| Subtotal Capital Cost | | | | $ 270,570 |
| Engineering (15%) | | | | $ 40,586 |
| Contingency (25%) | | | | $ 67,643 |
| | | | **Total Capital Cost:** | **$ 378,798** |
| **Annual Operation Maintenance:** | | | | |
| Inspection/Reporting/Contractor Oversight for Repairs | 1 | LS | $ 5,000 | $ 5,000 |
| Annual Operation Maintenance: | 1 | LS | $ 2,000 | $ 2,000 |
| **Total Annual O&M Cost** | | | | **$ 7,000** |
| Number of years ( n ): | | | | 30 |
| Interest rate ( I ): | | | | 6% |
| p/A value: | | | | 13.7648 |
| | | | **30 year O&M Present Worth (PW):** | **$ 96,354** |
| | | | | |
| **Total Present Worth (PW 30 year):** ***Capital Cost + O&M*** | | | | **$ 475,152** |

NOTES:

1 *Assumes preparation and implementation of site management plan and soil cover management plan to prevent direct contact with deeper soils.*

2 *Assumes replacing a small shallow section of storm water piping between catch basin near well MW-6 and canal.*

3 *Assumes site restoration involving placement of 6-inches of top soil with hydro seeding and placement of 6-inches of additional crusher-run road base for drive to substation from Ingersoll Street.*

**Table 6**

**Cost Estimate for Alternative S-5 - Remove Soil Above Part 375 Unrestricted Use SCOs**
**Albion Former MGP Site**
**Feasibility Study**

| Item | Quantity | Units | Unit Cost | Total Cost |
|---|---|---|---|---|
| **Capital Costs:** | | | | |
| Mobillization/Demobilization (equipment staging, decon) | 1 | LS | $ 100,000 | $ 100,000 |
| Temporary Fencing during Construction | 380 | LF | $ 37 | $ 14,060 |
| Health and Safety, Air, Vibration Monitoring | 1 | LS | $ 50,000 | $ 50,000 |
| Traffic Control/Temporary Road/Bridge Closure Coordination | 1 | LS | $ 10,000 | $ 10,000 |
| Erosion Control/Utility Demarcation | 1 | LS | $ 10,000 | $ 10,000 |
| *Remove Surface Soil/Historic Fill/Imapcted Till to 10 Feet:* | | | | |
| Demo concrete pad and around control tower | 1 | LS | $ 1,200 | $ 1,200 |
| Temporary relocation of power pole/lines | 1 | LS | $ 50,000 | $ 50,000 |
| Install and Remove Temporary Sheet Pile with Bracing | 7200 | SF | $ 65 | $ 468,000 |
| Soil Excavation | 1,800 | CY | $ 40 | $ 72,000 |
| Brace, Shore, and temporary plug Natural Gas Pipeline and other utilities | 1 | LS | $ 50,000 | $ 50,000 |
| Remove and Replace Shallow Storm Sewer Piping with Bedding | 60 | LF | $ 80 | $ 4,800 |
| Backfill Placement and Compaction | 1,620 | CY | $ 30 | $ 48,600 |
| Waste Characterization | 1 | LS | $ 1,000 | $ 1,000 |
| Solid Waste Transporation and Disposal | 3,150 | Ton | $ 75 | $ 236,250 |
| *Excavate Soil in Area of Western Gas Holder:* | | | | |
| Soil Excavation | 300 | CY | $ 40 | $ 12,000 |
| Backfill Placement and Compaction | 295 | CY | $ 30 | $ 8,850 |
| Waste Characterization | 1 | LS | $ 1,000 | $ 1,000 |
| Solid Waste Transporation and Disposal | 570 | Ton | $ 75 | $ 42,750 |
| *Excavate Soil in Area of well MW-8:* | | | | |
| Install and Remove Temporary Sheet Pile with Bracing | 1120 | SF | $ 65 | $ 72,800 |
| Soil Excavation | 130 | CY | $ 40 | $ 5,200 |
| Backfill Placement and Compaction | 125 | CY | $ 30 | $ 3,750 |
| Solid Waste Transporation and Disposal | 250 | Ton | $ 75 | $ 18,750 |
| Liquid/Groundwater Collection | 1 | LS | 20,000 | $ 20,000 |
| Liquid Waste Characterization | 2 | LS | $ 1,000 | $ 2,000 |
| Liquid Waste Transporation and Disposal | 40,000 | gal | $ 0.20 | $ 8,000 |
| Odor Control and Suppression/Dust Control | 1 | LS | $ 15,000 | $ 15,000 |
| Construction Oversight | 90 | day | $ 1,500 | $ 135,000 |
| Site Survey (pre- and post restoration, excavation limits) | 1 | LS | $ 10,000 | $ 10,000 |
| *Restoration:* | | | | |
| Replace Concrete Side Walk and Concrete Pad at Tower | 1 | LS | $ 12,000 | $ 12,000 |
| Deliver, Place Top Soil (6-inches) | 0.25 | acre | 25,000 | $ 6,250 |
| Hydro Seed | 0.25 | acre | $ 5,000 | $ 1,250 |
| Crushed Stone Drive | 40 | CY | $ 50 | $ 2,000 |
| Construction Closeout Report | 1 | LS | $ 25,000 | $ 25,000 |
| ***Subtotal:*** | | | | **$ 1,517,510** |
| Subtotal Capital Cost | | | | $ 1,517,510 |
| Engineering (15%) | | | | $ 227,627 |
| Contingency (25%) | | | | $ 379,378 |
| | | | **Total Capital Cost:** | **$ 2,124,514** |
| **Annual Operation Maintenance:** | | | | |
| None | - | | | $ 0 |
| **Total *Capital Cost:*** | | | | **$ 2,124,514** |

NOTES:

1 *Assumes no O&M because site would be suitable for unrestricted use.*

2 *Assumes sheet pile support required around permimeter of site in order to excavate to edge of property. Includes sheeting installation/removal for deep soil excavations adjacent to subsurface structures (vault area) near MW-8. May not be feasible to install sheeting near lift bridge structures and in area of high pressure natural gas pipeline.*

3 *Shoring and temporary end capping support will be required for underground natural gas pipeline that traverses the site and the storm sewer would be removed and re-installed.*

4 *Assumes higher soil excavation cost due to difficulties staging soil and trucks for off-site disposal.*

5 *Volume of water collected during dewatering assumes one Baker-type tank for each deep excavation area.*

6 *Assumes site restoration involving placement of 6-inches of top soil with hydro seeding and placement of 6-inches of additional*

**Table 7**

**Cost Estimate for Alternative GW-2 - Institutional Controls**
**Albion Former MGP Site**
**Feasibility Study**

| Item | Quantity | Units | Unit Cost | Total Cost |
|---|---|---|---|---|
| **Capital Costs:** | | | | |
| Institutional Controls (legal suport for deed restrictions, administrative controls) | 1 | LS | $ 25,000 | $ 25,000 |
| Development of Excavation Procedures for Groundwater Exposure | 1 | LS | $ 5,000 | $ 5,000 |
| ***Subtotal:*** | | | | **$ 30,000** |
| | | | **Total Capital Cost:** | **$ 30,000** |
| **Total Present Worth (PW 30 year):** ***Capital Cost*** | | | | **$ 30,000** |

NOTES:

1 *Assumes potential future SMP implementation activities that require minimizing worker exposure to groundwater would be addressed through selected soil remedial alternative.*

**Table 8**

**Cost Estimate for Alternative GW-3 - Institutional Controls with Monitored Natural Attenuation**
**Albion Former MGP Site**
**Feasibility Study**

| Item | Quantity | Units | Unit Cost | Total Cost |
|---|---|---|---|---|
| **Capital Costs:** | | | | |
| Institutional Controls (legal suport for deed restrictions, administrative controls) | 1 | LS | $ 25,000 | $ 25,000 |
| Development of Site Management Plan (SMP) | 1 | LS | $ 5,000 | $ 5,000 |
| Monitoring Well Installation (2 new wells downgradient from well MW- 8) | 1 | LS | $ 8,000 | $ 8,000 |
| ***Subtotal:*** | | | | **$ 38,000** |
| Subtotal Capital Cost | | | | $ 38,000 |
| Engineering (15%) | | | | $ 5,700 |
| Contingency (25%) | | | | $ 9,500 |
| | | | **Total Capital Cost:** | **$ 53,200** |
| **Annual Operation Maintenance:** | | | | |
| Semi-Annual Groundwater Sampling (5 wells) | 2 | LS | $ 5,000 | $ 10,000 |
| Laboratory Analysis | 12 | EA | $ 500 | $ 6,000 |
| Annual Reporting | 1 | LS | $ 5,000 | $ 5,000 |
| **Total Annual O&M Cost (First 5 years)** | | | | **$ 21,000** |
| Number of years ( n ): | | | | 5 |
| Interest rate ( I ): | | | | 6% |
| p/A value: | | | | 4.2124 |
| | | | **5 year O&M Present Worth (PW):** | **$ 88,460** |
| **Annual Operation Maintenance:** | | | | |
| Semi-Annual Groundwater Sampling (5 wells) | 1 | LS | $ 5,000 | $ 5,000 |
| Laboratory Analysis | 6 | EA | $ 500 | $ 3,000 |
| Annual Reporting | 1 | LS | $ 5,000 | $ 5,000 |
| **Total Annual OM&M Cost (6 through 30 years)** | | | | **$ 13,000** |
| Number of years ( n ): | | | | 25 |
| Interest rate ( I ): | | | | 6% |
| p/A value: | | | | 8.3440 |
| | | | **6 through 30 year O&M Present Worth (PW):** | **$ 108,472** |
| **Total Present Worth (PW 30 year):** ***Capital Cost + OM&M*** | | | | **$ 250,132** |

NOTES:

1 *Assumes operation and maintenance includes, inspections, reporting, monthly mowing, once annually providing oversight of a construction or utility worker implementing the SMP to address potential contact with groundwater.*

2 *Groundwater sample collection and analysis from 5 wells including 2 replacement wells.*

3 *Sampling and analysis would be conducted on a semi-annual basis for the first 5 years and annually until year 30.*

**Table 9**

**Cost Estimate for Alternative GW-4 - Institutional Controls with Enhanced Monitored Natural Attenuation**
**Albion Former MGP Site**
**Feasibility Study**

| Item | Quantity | Units | Unit Cost | Total Cost |
|---|---|---|---|---|
| **Capital Costs:** | | | | |
| Institutional Controls (legal suport for deed restrictions, administrative controls) | 1 | LS | $ 25,000 | $ 25,000 |
| Development of Site Management Plan (SMP) | 1 | LS | $ 5,000 | $ 5,000 |
| Pilot scale testing of ORC injection | 1 | LS | $ 50,000 | $ 50,000 |
| Full Scale Injection Well Field with ORC | 10 | EA | $ 3,000 | $ 30,000 |
| Monitoring Well Installation (2 new wells downgradient from well MW- 8) | 1 | LS | $ 8,000 | $ 8,000 |
| ***Subtotal:*** | | | | **$ 118,000** |
| Subtotal Capital Cost | | | | $ 118,000 |
| Engineering (15%) | | | | $ 17,700 |
| Contingency (25%) | | | | $ 29,500 |
| | | | **Total Capital Cost:** | **$ 165,200** |
| **Annual Operation Maintenance:** | | | | |
| Quarterly ORC Applications | 20 | EA | $ 300 | $ 6,000 |
| Quarterly-Annual Groundwater Sampling (5 wells) | 4 | LS | $ 5,000 | $ 20,000 |
| Laboratory Analysis | 12 | EA | $ 500 | $ 6,000 |
| Annual Reporting | 1 | LS | $ 5,000 | $ 5,000 |
| **Total Annual O&M Cost (First 5 years)** | | | | **$ 37,000** |
| Number of years ( n ): | | | | 5 |
| Interest rate ( I ): | | | | 6% |
| p/A value: | | | | 4.2124 |
| | | | **5 year O&M Present Worth (PW):** | **$ 155,859** |
| **Annual Operation Maintenance:** | | | | |
| Semi-Annual ORC Applications | 50 | EA | $ 300 | $ 15,000 |
| Semi-Annual Groundwater Sampling (5 wells) | 2 | LS | $ 5,000 | $ 10,000 |
| Laboratory Analysis | 6 | EA | $ 500 | $ 3,000 |
| Annual Reporting | 1 | LS | $ 5,000 | $ 5,000 |
| **Total Annual OM&M Cost (6 through 30 years)** | | | | **$ 33,000** |
| Number of years ( n ): | | | | 25 |
| Interest rate ( I ): | | | | 6% |
| p/A value: | | | | 8.3440 |
| | | | **6 through 30 year O&M Present Worth (PW):** | **$ 275,352** |
| **Total Present Worth (PW 30 year):** ***Capital Cost + OM&M*** | | | | **$ 596,411** |

NOTES:

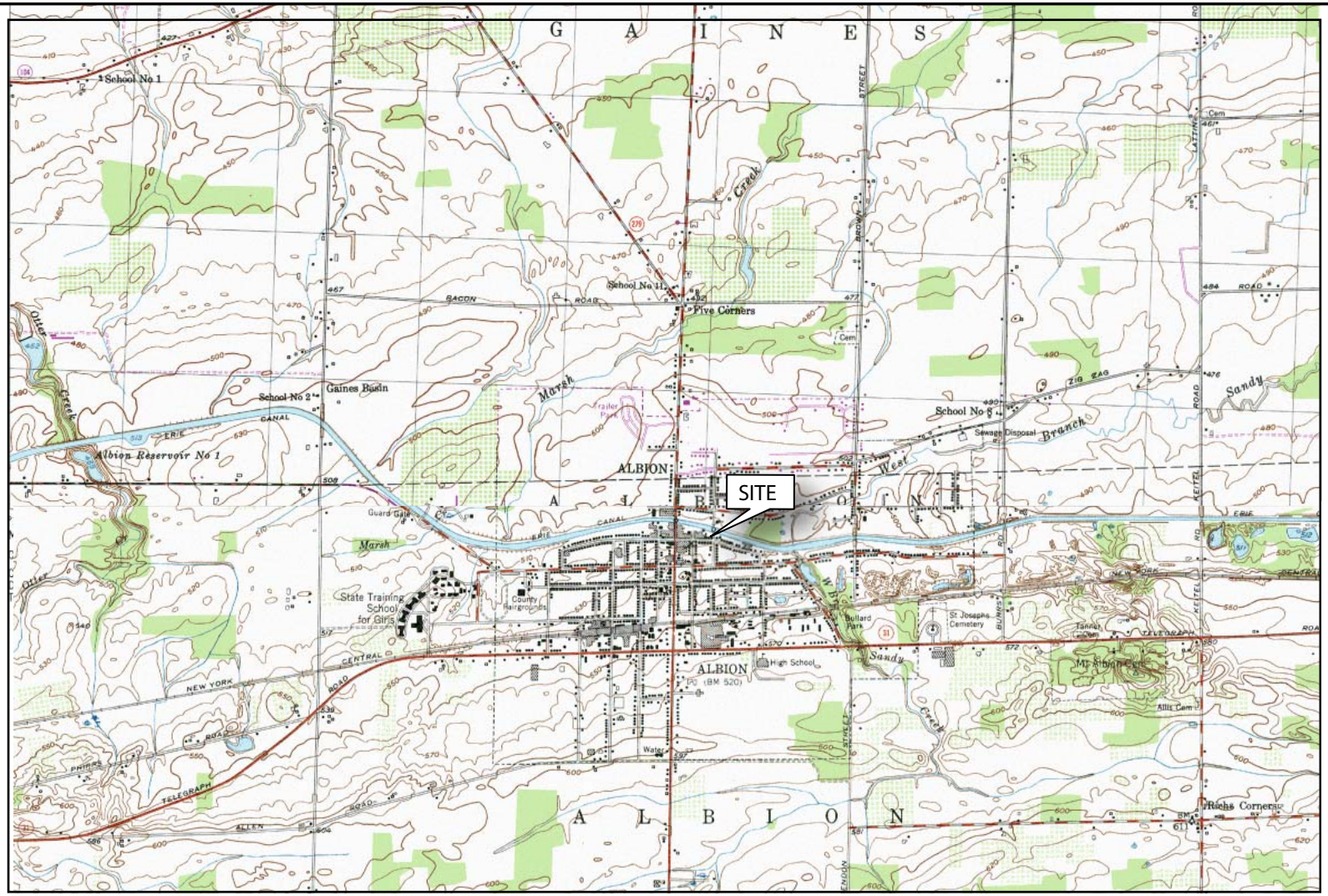
1 *Assumes operation and maintenance includes, inspections, reporting, monthly mowing, once annually providing oversight of a construction or utility worker implementing the SMP to address potential contact with groundwater.*

2 *Assumes pilot scale testing is successful and ORC injections are conducted quarterly for five years and semi-annually until year 30.*

3 *Groundwater sample collection and analysis from 5 wells including 2 replacement wells.*

4 *Sampling and analysis would be conducted on a quarterly for the first 5 years and semi-annually until year 30.*

# FIGURES





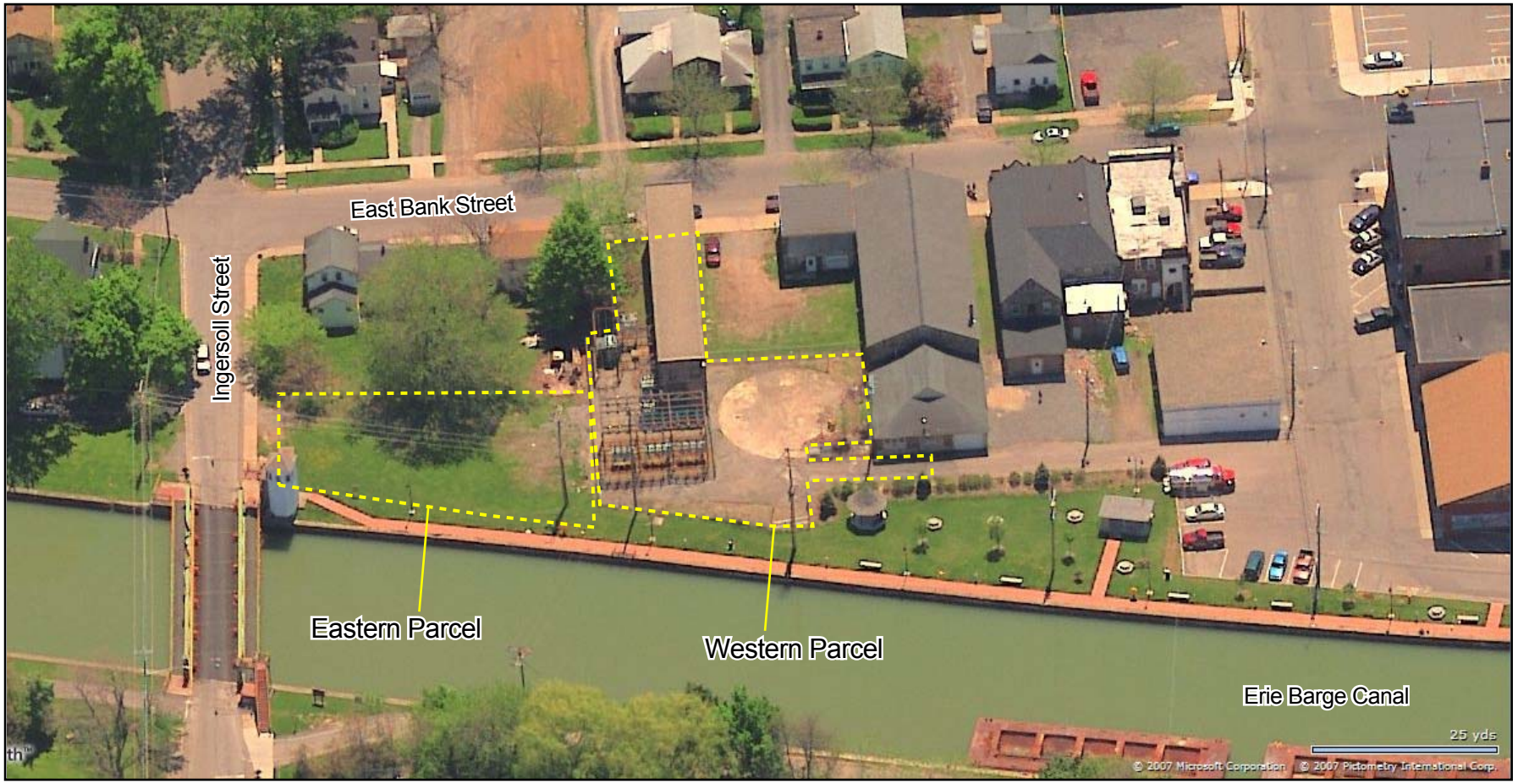
0 1.0 2.0

SCALE
(miles, approximate)

N

SITE LOCATION MAP
Albion Former MGP
Albion, New York

| By: MAC | Date: 10/2007 | Project No. 7800.004 |
|---|---|---|
| AMEC Geomatrix | Figure 1 | |




*View to South

AERIAL VIEW
Albion Former MGP
Albion, New York

| By: MAC | Date: 10/2007 | Project No. 7800.004 |
|---|---|---|
| AMEC Geomatrix | Figure | 2A |

N77°00'00"W
17.96'

)°24'00"E
36.90'

N.Y.S. BARGE CANAL

Erie Barge Canal

S03°11'25"W
38.49'

RETAINING WALL

N80

N86°32'35"W
85.32'

N8

S73°05'00"E
251.00'

RETAINING WALL

S03°11'25"W
16.00'

11'25"E
70.00

6°32'35"W
27.50'

Site Boundary

Canal Retaining Wall

Ingersoll St. Lift Bridge

Control Tower

Bridge Lift-Structure Pit

FLOW

Manhole

Former Structure

Former Structure

Former Structure

Former Structure

vault

Electric Substation Property

BU

830

CONC. PAD

CING

UILDING

LANDS N/F OF
JAMES WOODHAMS
(428/212)

BUILI

LANI

97)

OS N/F OF
DONALD & LAURA
RACE
(406/99

N03°

(406/9

N86°32'35"W
66.80'

LANDS N/F OF
DONALD & LAURA RACE
( )97)

S02°52'00"W
80.00'

BUILDING

BUILDING

GRAVEL

N86°32'46"W
47.93'

S02°52'00"W
181.51'

N86°32'35"W

1 STY.
BARN

(demolished)

LANDS N/F OF
WENDELL & JOAN
SMITH
(403/256)

2 STY.
MASONARY
BUILDING

LANDS N/F OF
JERRY & ROXANNE
WAGNER
(412/406)

1 1/2 STY.
WOOD FRAME

20" diameter
Sanitary Sewer
(approximate)

INGERSOLL STREET

(66' ROW)

Manhole

(66' ROW) EAST BANK STREET

20 0 20 40

SCALE (ft. approximate)

SITE LAYOUT
Albion Former MGP
Albion, New York

| By: MAC | Date: 12/29/2005 | Project No. 7800.004 |
|---|---|---|
| AMEC Geomatrix | Figure | 2B |

Q:\CorpStndrs\MASTERS\GDS\Titleblocks\11x17 Landscape MASTER.ai

N77°00'00"W
17.96'

...V. Y. S. BARGE CANAL

...°24'00"E
36.90'

S03°11'25"W
38.49'

RETAINING WALL

N80

N86°32'35"W
85.32'

A

MW-1

SS-1

3°05'00"E
251.00'

RETAINING WALL

S03°11'25"W
16.00'

MW-3

...6°32'35"W
...22.50'

...11'25"E
70.00'

BU

CONC. PAD

SB-29

SB-30

830

MW-7

Canal Retaining Wall

Ingersol St. Lift Bridge

FLOW

SUPP-B-1*

Control Tower

Bridge Lift-Structure Pit

B'

SB-1

SB-2

SB-7

SS-2

SS-3

SS-1R

MW-5/SB-5

SS-4

SUPP-B-2

SUPP-B-3

SB-16

SB-28

SB05-6

Manhole

SB-9

SB-18

SB-10

SB-21

SB-4

SB-17

SB-20

SB-8

SB-13

SUPP-B-5

SB-15

SUPP-B-6

vault

S02°52'00"W
181.51'

SB-3

MW-8

SB-19

CB-1

MW-6/SB-6

SUPP-B-4

SB-25

SB-27

SB-26

SB-12

SB-14

SB-23

SB-22

B

SB-24

MW-10

A'

1 STY. BARN

SB05-1

SB05-2

SB05-3

SB05-4

SB05-5

20" diameter Sanitary Sewer (approximate)

MW-2
(406/9

N86°32'35"W
66.80'

...ANDS N/F OF
...ONALD & LAURA RACE
...)97)

S02°52'00"W
80.00'

BUILDING

MW-4

LANDS N/F OF
WENDELL & JOAN
SMITH
(403/256)

LANDS N/F OF
JERRY & ROXANNE
WAGNER
(412/406)

SIDEWALK

INGERSOLL STREET

...ILDING

GRAVEL

N86°32'46"W
47.93'

SIDE WALK

MW-9

(66' ROW)

Manhole

N

20 0 20 40

SCALE (ft. approximate)

EAST BANK STREET

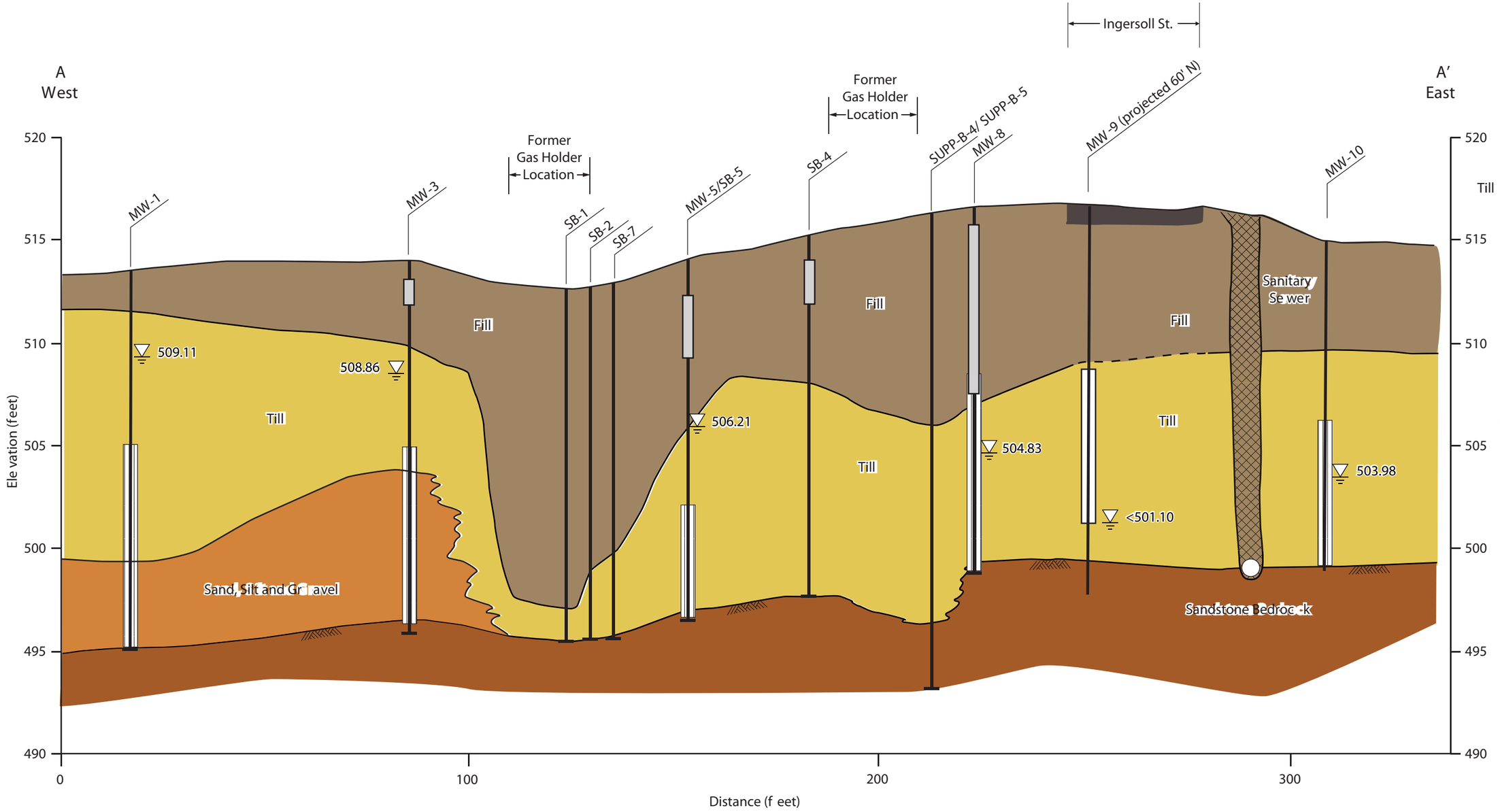
## EXPLANATION

- B-3 ▲ Geomatrix Soil Boring Location completed to bedrock (*B-1refusal at 9 feet)
- SB05-1 ▲ Geomatrix Surface/Shallow Soil Sample Location
  - -Geomatrix surface soil sample designation: SS05-**
  - -Geomatrix shallow soil sample designation: SB05-**
- SB-8 S&W Soil Boring Location
- SS-4 S&W Surface Soil Sample Location
- MW-4 Monitoring Well Location
- Former Gasholder Locations
- MW-9 Existing groundwater monitoring well
- Overhead Electric/ Telephone
- Buried Gas Line (approximate location)
- 20" dia. Sanitary Sewer
- Utility Pole Location
- Storm Sewer Pipe

Q:\Corp5\ndrs\MASTERS\GDS\T itleblocks\11x17 Landscape MASTERai

# Soil Boring, Monitoring Well and Geologic Cross Section Locations
## Albion Former MGP Site
## Albion, New York

| By: MAC | Date: 10/2007 | Project No. 7800.004 |
|---|---|---|
| AMEC Geomatrix | Figure 3 | |



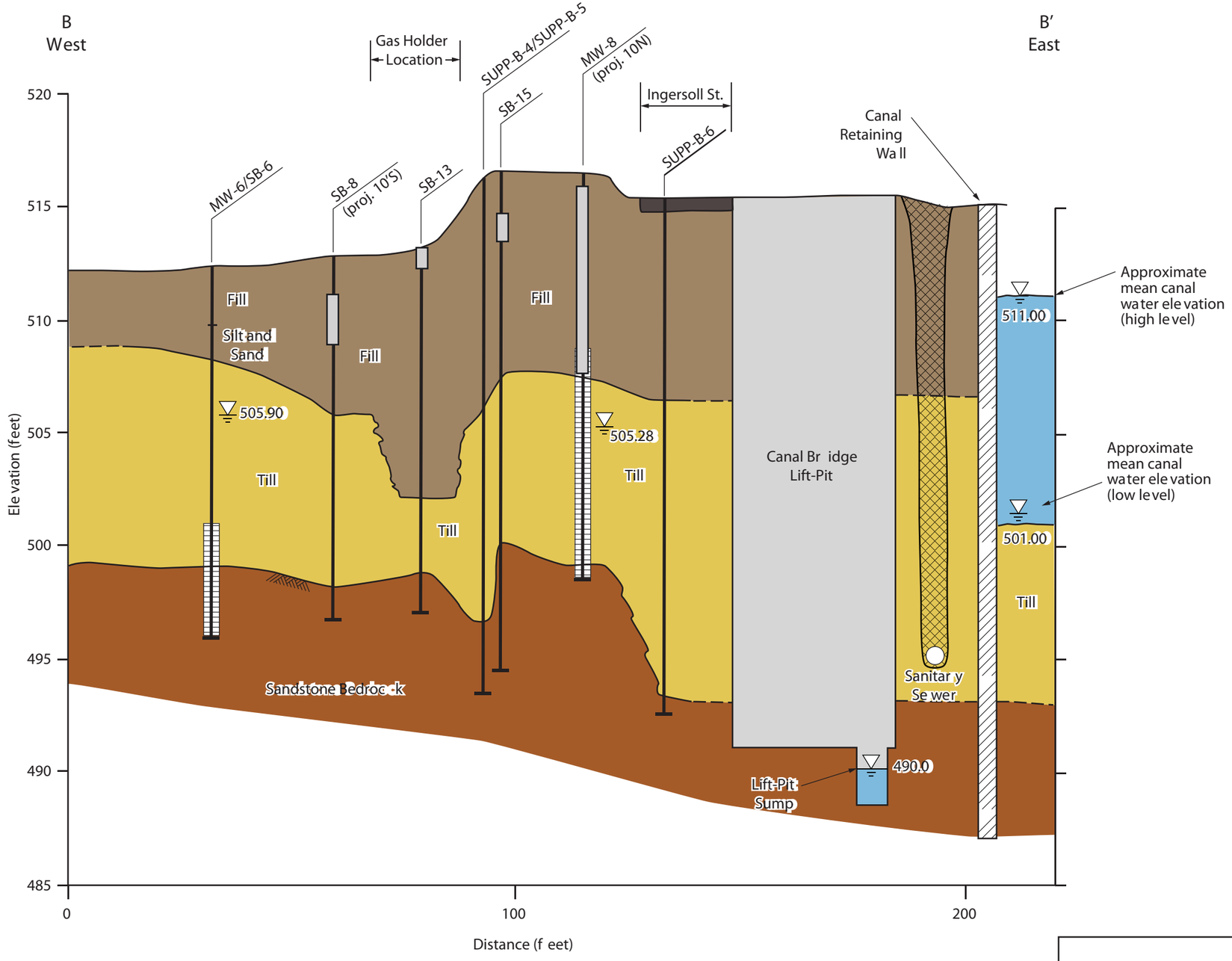

ALM/CLM layer thickness

506.21 Groundwater Elevation (fasl)
(June 2007 data)

MW-1
Monitoring Well Screened Interval

GEOLOGIC CROSS SECTION A-A'
Albion Former MGP Site
Albion, New York

| By: MAC | Date: 8/2007 | Project No . 7800.004 |
|---|---|---|
| AMEC Geomatrix | | Figure 4A |




ALM/CLM layer thickness

508.89 Groundwater Elevation (fasl)
(November 2005 data)

MW-8 Monitoring Well Screened Interval

GEOLOGIC CROSS SECTION B-B'
Albion Former MGP Site
Albion, New York

| By: MAC | Date: 12/29/05 | Project No . 7800.004 |
|---|---|---|
| AMEC Geomatrix | | Figure 4B |

## EXPLANATION

(508.89) Groundwater Elevation Data (June 6, 2007 Data)

506 Groundwater Elevation Contour (feet above sea level)

Groundwater Flow Direction

(490.00*) Approximate groundwater elevation in lift-pit sump

N77°00'00"W 17.96'

W.Y.S. BARGE CANAL

)°24'00"E 36.90'

S03°11'25"W 38.49'

RETAINING WALL

N80

N86°32'35"W 85.32'

S73°05'00"E 251.00'

MW-1 (509.11)

N8

RETAINING WALL

Canal Retaining Wall

509

MW-7 (508.43)

S03°11'25"W 16.00'

MW-3 (508.86)

508

507

506

505

504

503

Control Tower

Ingersol St. Lift Bridge

Bridge Lift-Structure Pit

(490.00*)

FLOW

Manhole

MW-5 (506.21)

11'25"E 70.00'

6°32'35"W 7.50'

BU

830

CONC. PAD

N03°

ING

UILDING

LANDS N/F OF JAMES WOODHAMS (428/212)

OS N/F OF DONALD & LAURA RACE (406/99

BUILI

LANI

97)

(506.06) MW-2 (406/9

N86°32'35"W 66.80'

LANDS N/F OF DONALD & LAURA RACE ( )97)

BUILDING

(505.02) MW-4

GRAVEL

S02°52'00"W 181.51'

MW-6 (NA)

N86°32'35"W

1 STY. BARN

S02°52'00"W 80.00'

BUILDING

LANDS N/F OF WENDELL & JOAN SMITH (403/256)

2 STY. MASONARY BUILDING

N86°32'46"W 47.93'

SIDEWALK

LANDS N/F OF JERRY & ROXANNE WAGNER (412/406)

1 1/2 STY. WOOD FRAME

Vault

MW-8 (504.83)

SIDEWALK

MW-9 (<501.1)

INGERSOLL STREET

(66' ROW)

Manhole

(503.98) MW-10

20" diameter Sanitary Sewer (approximate)

N

20 0 20 40

SCALE (ft. approximate)

(66' ROW) EAST BANK STREET

OVERBURDEN GROUNDWATER CONTOUR MAP
June 2007 (High Canal Water Level)
Albion Former MGP Site
Albion, New York

| By: MAC | Date: 10/2007 | Project No. 7800.004 |
|---|---|---|
| **AMEC Geomatrix** | Figure | **5** |

I:/Project/7800.004 Niagara Mohawk Albion Former MGP/Figures/ Figure 2 Site Layout and Sampling locations.pdf

# EXPLANATION

- SS-2 — S&W Shallow Soil Sample Location
- SB05-4 — Geomatrix Shallow Soil Sample Location
- B-3 — Geomatrix Soil Boring Location
- SB-8 — S&W Soil Boring Location
- MW-4 — Monitoring Well Location
- Former Gas Holder Location

| SB05-01 | Concentration (mg/kg) | |
|---|---|---|
| Compound | 0 - 2 in. | 3.3 - 3.5 ft. |
| Benzo(a)pyrene | 3.5 | 1.2 J |
| Dibenzo(a,h)anthracene | 0.66 J | -- |

-- Concentration below Part 375 Restricted Use SCO for Commercial Property
J- laboratory estimated value

Sample Depth

| SB-11 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)anthracene | 13 |
| Chrysene | 12 |
| Benzo(b)fluoranthene | 16 |
| Benzo(a)pyrene | 16 |
| Indeno(1,2,3-c,d)pyrene | 9.5 |
| Dibenzo(a,h)anthracene | 3.3 J |

| SS-3 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 4 in. |
| Benzo(a)pyrene | 1.7 |
| Dibenzo(a,h)anthracene | 0.57 |

| SB-10 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)anthracene | 38 |
| Chrysene | 34 |
| Benzo(b)fluoranthene | 38 |
| Benzo(a)pyrene | 42 |
| Indeno(1,2,3-c,d)pyrene | 25 |
| Dibenzo(a,h)anthracene | 9.4 J |

| SB-9 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)pyrene | 1.4 J |

| CB-1 |
|---|
| No compounds above SCOs |

| SB-19 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Phenanthrene | 1200.0 |
| Fluoranthene | 1500.0 |
| Pyrene | 1200.0 |
| Benzo(a)anthracene | 720.0 |
| Chrysene | 600.0 |
| Benzo(b)fluoranthene | 440.0 |
| Benzo(k)fluoranthene | 590.0 |
| Benzo(a)pyrene | 590.0 |
| Indeno(1,2,3-c,d)pyrene | 300.0 J |
| Dibenzo(a,h)anthracene | 130.0 J |

| SB-6 | Concentration (mg/kg) |
|---|---|
| Compound | 4-6 ft. |
| Benzo(a)pyrene | 3.3 |
| Dibenzo(a,h)anthracene | 0.99 |

| SB05-01 | Concentration (mg/kg) | |
|---|---|---|
| Compound | 0 - 2 in. | 3.3 - 3.5 ft. |
| Benzo(a)pyrene | 3.5 | 1.2 J |
| Dibenzo(a,h)anthracene | 0.66 J | -- |

| SB-27 | Concentration (mg/kg) |
|---|---|
| Compound | 18 - 24 in. |
| Phenanthrene | 720.0 |
| Fluoranthene | 1000.0 |
| Pyrene | 990.0 |
| Benzo(a)anthracene | 650.0 |
| Chrysene | 590.0 |
| Benzo(b)fluoranthene | 390.0 |
| Benzo(k)fluoranthene | 520.0 |
| Benzo(a)pyrene | 510.0 |
| Indeno(1,2,3-c,d)pyrene | 300.0 |
| Dibenzo(a,h)anthracene | 110.0J |

| SB-21 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)anthracene | 47.0 |
| Chrysene | 46.0 |
| Benzo(b)fluoranthene | 59.0 |
| Benzo(k)fluoranthene | 54.0 |
| Benzo(a)pyrene | 75.0 |
| Indeno(1,2,3-c,d)pyrene | 60.0 |
| Dibenzo(a,h)anthracene | 21.0 |

| SS-1R, SS-2, SS-4 |
|---|
| No compounds above SCOs |

| SB-20 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)anthracene | 40.0 |
| Chrysene | 35.0 |
| Benzo(b)fluoranthene | 32.0 |
| Benzo(a)pyrene | 34.0 |
| Indeno(1,2,3-c,d)pyrene | 13.0 |
| Dibenzo(a,h)anthracene | 5.9J |

| SB05-02 | Concentration (mg/kg) | |
|---|---|---|
| Compound | 0 - 2 in. | 2 - 3 ft. |
| Benzo(a)anthracene | 27 | -- |
| Benzo(a)pyrene | 22 | 3.9 |
| Benzo(b)fluoranthene | 39 | -- |
| Chrysene | 26 | -- |
| Dibenzo(a,h)anthracene | 4 J | 0.64 J |
| Indeno(1,2,3-c,d)pyrene | 12 | -- |

| SB05-03 | Concentration (mg/kg) | |
|---|---|---|
| Compound | 0 - 2 in. | 1.3 - 2.5 ft. |
| Benzo(a)anthracene | -- | 16 |
| Benzo(a)pyrene | -- | 13 |
| Benzo(b)fluoranthene | -- | 17 |
| Chrysene | -- | 14 |
| Dibenzo(a,h)anthracene | -- | 1.7 J |

| SB-13 | Concentration (mg/kg) | |
|---|---|---|
| Compound | 0 - 2 ft. | 4-6 ft. |
| Benzo(a)anthracene | 68 | 21 |
| Chrysene | 56 | 18 |
| Benzo(b)fluoranthene | 45 | 19 |
| Benzo(a)pyrene | 54 | 22 |
| Indeno(1,2,3-c,d)pyrene | 22 | 10 |
| Dibenzo(a,h)anthracene | 9.6 J | 4.1 |

| SB-15 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)pyrene | 5.2 |
| Dibenzo(a,h)anthracene | 1.2 J |

| SB05-6 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 in. |
| Benzo(a)anthracene | 7.6 |
| Benzo(a)pyrene | 8.8 |
| Benzo(b)fluoranthene | 11.0 |
| Chrysene | 6.5 |
| Dibenzo(a,h)anthracene | 1.4 J |

| SB-12 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)anthracene | 48 |
| Chrysene | 43 |
| Benzo(b)fluoranthene | 53 |
| Benzo(a)pyrene | 58 |
| Indeno(1,2,3-c,d)pyrene | 36 |
| Dibenzo(a,h)anthracene | 17 |

| SB05-05 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 in. |
| No compounds above SCOs | |

| SB05-04 | Concentration (mg/kg) | |
|---|---|---|
| Compound | 0 - 2 in. | 1.5 - 3 ft. |
| Benzo(a)pyrene | 5.8 | 2.2 |
| Benzo(b)fluoranthene | 7.4 | -- |
| Dibenzo(a,h)anthracene | 1.6 J | -- |

| SB-26 | Concentration (mg/kg) | |
|---|---|---|
| Compound | 0 - 2 in. | 18 - 24 in. |
| Benzo(a)anthracene | 20.0 | 13.0 |
| Chrysene | 19.0 | 13.0 |
| Benzo(b)fluoranthene | 23.0 | 16.0 |
| Benzo(a)pyrene | 25.0 | 17.0 |
| Indeno(1,2,3-c,d)pyrene | 23.0 | 17.0 |
| Dibenzo(a,h)anthracene | 8.2 | 6.9 |

| SB-25 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(b)fluoranthene | 6.4 |
| Benzo(a)pyrene | 6.9 |
| Dibenzo(a,h)anthracene | 0.93J |

| SB-23 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)anthracene | 44.0 |
| Chrysene | 39.0 |
| Benzo(b)fluoranthene | 51.0 |
| Benzo(k)fluoranthene | 64.0 |
| Benzo(a)pyrene | 64.0 |
| Indeno(1,2,3-cd)pyrene | 21.0 |
| Dibenzo(a,h)anthracene | 9.5 J |

| SB-22 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)pyrene | 1.1 J |

| SB-14 | Concentration (mg/kg) |
|---|---|
| Compound | 0 - 2 ft. |
| Benzo(a)anthracene | 56 |
| Chrysene | 50 |
| Benzo(b)fluoranthene | 49 |
| Benzo(a)pyrene | 64 |
| Indeno(1,2,3-c,d)pyrene | 68 |
| Dibenzo(a,h)anthracene | 23 |

| SB-24 | Concentration (mg/kg) | |
|---|---|---|
| Compound | 0 - 2 in. | 18 - 24 in. |
| Pyrene | -- | 52.0 |
| Benzo(a)anthracene | 13.0 | 60.0 |
| Chrysene | 13.0 | 55.0 |
| Benzo(b)fluoranthene | 16.0 | 58.0 |
| Benzo(a)pyrene | 22.0 | 68.0 |
| Indeno(1,2,3-c,d)pyrene | 9.8 | 44.0 |
| Dibenzo(a,h)anthracene | 3.7J | 15.0J |

SUPP-B-1 SUPP-B-2 SUPP-B-3 SUPP-B-4 SUPP-B-5
Control Tower
Bridge Lift-Structure
MW-5/SB-5 MW-8 MW-6/ SB-6
SB-1 SB-2 SB-3 SB-4 SB-5 SB-7 SB-8 SB-9 SB-10 SB-11 SB-12 SB-13 SB-14 SB-15 SB-16 SB-17 SB-18 SB-19 SB-20 SB-21 SB-22 SB-23 SB-24 SB-25 SB-26 SB-27 SB-28
SS-1R SS-2 SS-3 SS-4
CB-1
SB05-1 SB05-2 SB05-3 SB05-4 SB05-5 SB05-6
1 STY. BARN
2 STY.
1 1/2 STY. WOOD FRAME
LANDS N/F OF ... & ROXANNE ... (406)
LANDS N/F OF WENDE SMITH (403/2)
SIDEWALK
Manhole

20 0 20
SCALE (ft. approximate)

PAHs ABOVE PART 375 SCOs IN SURFACE/ SHALLOW SOIL SAMPLES
Albion Former MGP Site
Albion, New York

| By: MAC | Date: 11/2007 | Project No. 7800.004 |
|---|---|---|
| AMEC Geomatrix | Figure 6 | |

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## EXPLANATION

8-12 ft — PAHs detected above Part 375 SCOs

Analytical Sample Collection Depth

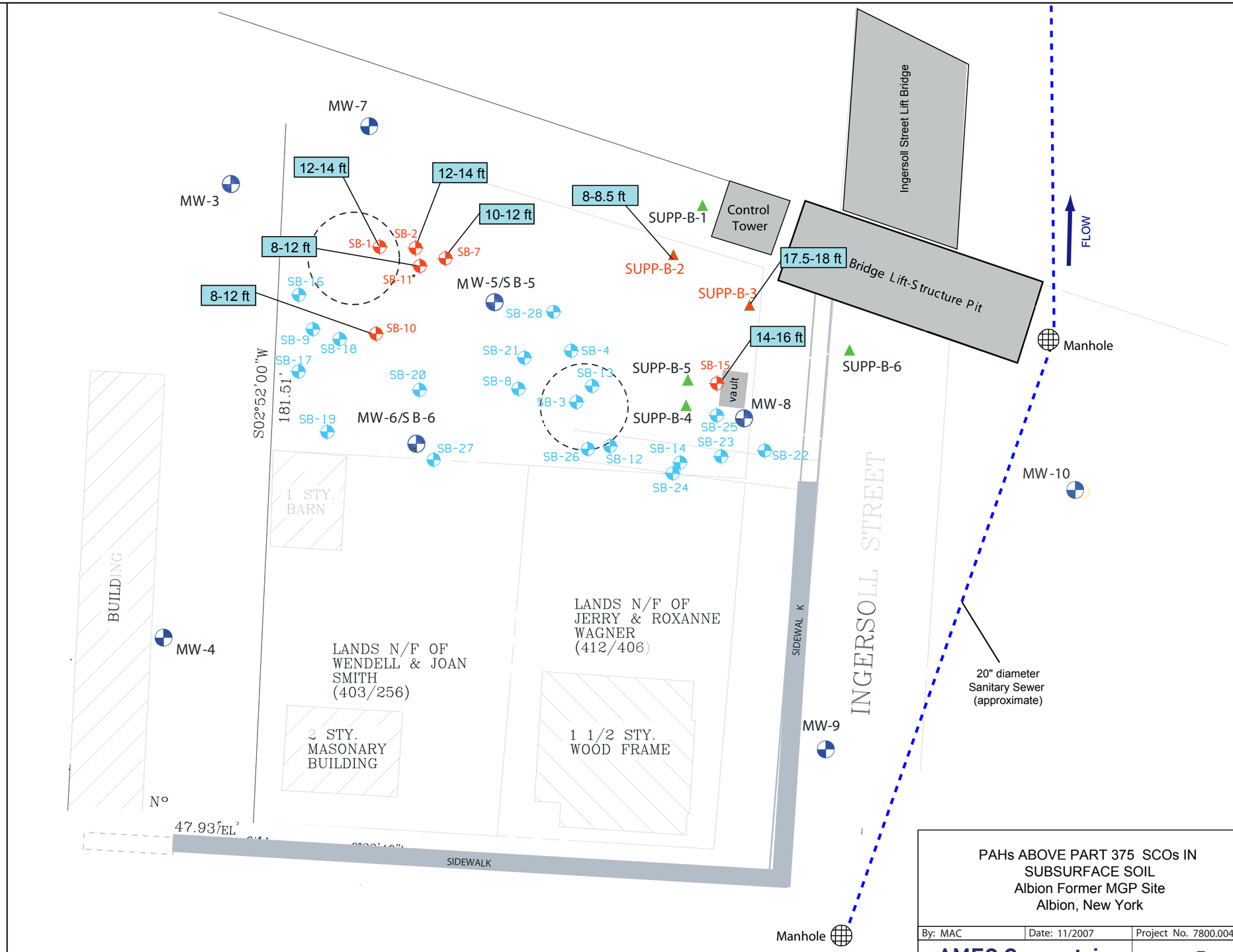
B-3 — Geomatrix Soil Boring Location

SB-8 — S&W Soil Boring Location

MW-4 — Monitoring Well Location

Former Gas Holder Location

* PAH exceedance at SB-11 includes Naphthalene. Naphthalene was not detected above Part 375 SCOs at any other location.




20 0 20

SCALE (ft. approximate)

PAHs ABOVE PART 375 SCOs IN SUBSURFACE SOIL
Albion Former MGP Site
Albion, New York

| By: MAC | Date: 11/2007 | Project No. 7800.004 |
|---|---|---|
| AMEC Geomatrix | | Figure 7 |

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## EXPLANATION

Depth interval of:

Trace NAPL (ganglia or laminations) observed in upper till — 17-19'

MGP Residual Material (Coal Tar) — 12-18'

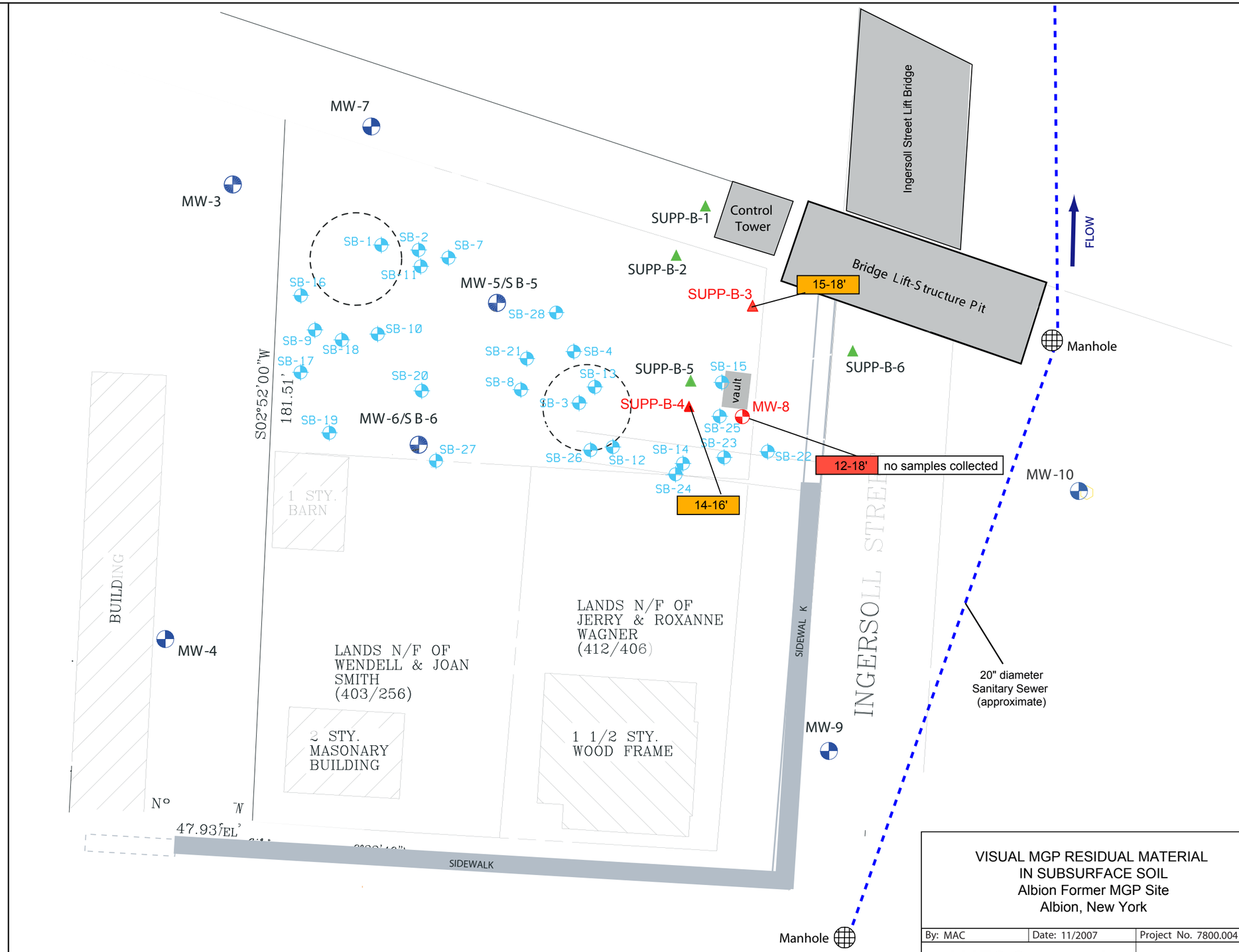
Analytical Sample Collection Depth

B-3 Geomatrix Soil Boring Location

SB-8 S&W Soil Boring Location

MW-4 Monitoring Well Location

Former Gas Holder Location




20 0 20

SCALE (ft. approximate)

VISUAL MGP RESIDUAL MATERIAL
IN SUBSURFACE SOIL
Albion Former MGP Site
Albion, New York

| By: MAC | Date: 11/2007 | Project No. 7800.004 |
|---|---|---|
| AMEC Geomatrix | | Figure 8 |

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## EXPLANATION

| MW-3 | 12/1999 | 7/2001 |
|---|---|---|
| BTEX | ND | ND |
| Naphthalene | ND | ND |
| Total Cyanide | *0.475* | NA |

- MW-3 → Monitoring Well ID
- 12/1999, 7/2001 → Sampling Date
- BTEX, Naphthalene → Concentration in Groundwater (ug/L)
- Total Cyanide → Cyanide Concentration in Groundwater (mg/L)

ND- Compound not detected
NA- Compound not analyzed

*0.475* - indicates one or more compounds detected above TOGS 1.1.1 Class GA Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998.

* bedrock monitoring well

N77°00'00"W 17.96'

...°24'00"E 36.90'

...Y.S. BARGE CANAL

S03°11'25"W 38.49'

N80...

85.32'

| MW-1 | 12/1999 | 7/2001 |
|---|---|---|
| BTEX | ND | ND |
| Naphthalene | ND | ND |
| Total Cyanide | 0.059 | NA |

MW-1

S73°05'00"E 251.00'

RETAINING WALL

| MW-7 | 7/2001 |
|---|---|
| BTEX | ND |
| Naphthalene | ND |
| Total Cyanide | NA |

MW-7*

S03°11'25"W 16.00'

MW-3

...6°32'35"W ...7.50'

11'25"E 70.00'

| MW-5 | 12/1999 | 7/2001 | 6/2005 |
|---|---|---|---|
| BTEX | *332* | *324* | *312.3* |
| Naphthalene | *18* | *55* | 2.0J |
| Total Cyanide | *0.270* | NA | *0.253* |

MW-5

| MW-3 | 12/1999 | 7/2001 |
|---|---|---|
| BTEX | ND | ND |
| Naphthalene | ND | ND |
| Total Cyanide | *0.475* | NA |

BU

CONC. PAD

...DING

| MW-2 | 12/1999 | 7/2001 |
|---|---|---|
| BTEX | ND | ND |
| Naphthalene | ND | ND |
| Total Cyanide | 0.043 | NA |

LANDS N/F OF JAMES WOODHAMS (428/212)

(406/99

BUILI

MW-2

LANI

...97)

N86°32'35"W 66.80'

LANDS N/F OF DONALD & LAURA RACE (...97)

S02°52'00"W 181.51'

MW-6

N86°32'35"W

| MW-6 | 12/1999 | 7/2001 | 6/2005 |
|---|---|---|---|
| BTEX | ND | ND | ND |
| Naphthalene | ND | ND | ND |
| Total Cyanide | 0.078 | NA | 0.029 |

BUILDING

MW-4

| MW-4 | 12/1999 | 7/2001 |
|---|---|---|
| BTEX | 0.2J | ND |
| Naphthalene | ND | ND |
| Total Cyanide | ND | NA |

BUILDING

GRAVEL

LANDS N/F OF WENDELL & JOAN SMITH (403/256)

2 STY. MASONARY BUILDING

N86°32'46"W 47.93'

SIDEWALK

EAST BANK STREET

Vault

MW-8

| MW-8 | 6/2005 | 11/2005 |
|---|---|---|
| BTEX | *4410* | *10,780* |
| Naphthalene | *5300* | *3000* |
| Total Cyanide | *0.452* | *0.374* |

LANDS N/F OF JERRY & ROXANNE WAGNER (412/406)

MW-9

| MW-9 | 11/2005 | 6/2007 |
|---|---|---|
| BTEX | ND | Dry |
| Naphthalene | 1.9J | Dry |
| Total Cyanide | NA | Dry |

SIDEWALK

Ingersol St. Lift Bridge

Control Tower

Bridge Lift-Structure Pit

FLOW

| Pit Sump | 11/2005 |
|---|---|
| BTEX | ND |
| Naphthalene | 2.0J |
| Total Cyanide | *0.473* |

Manhole

20" diameter Sanitary Sewer (approximate)

MW-10

| MW-10 | 6/2007 |
|---|---|
| BTEX | ND |
| Naphthalene | ND |
| Total Cyanide | ND |

INGERSOL STREET

Manhole

N

20 0 20 40

SCALE (ft. approximate)

# SUMMARY OF MGP INDICATORS IN GROUNDWATER
## Albion Former MGP Site
## Albion, New York

| By: MAC | Date: 11/2007 | Project No. 7800.004 |
|---|---|---|
| **AMEC Geomatrix** | Figure **9** | |

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# EXPLANATION

SS-2 — S&W Shallow Soil Sample Location

SB05-4 — Geomatrix Shallow Soil Sample Location

B-3 — Geomatrix Soil Boring Location

SB-8 — S&W Soil Boring Location

MW-4 — Monitoring Well Location

Former Gas Holder Location

Approximate Excavation Limits and Soil Cover

| SB05-01 | | |
|---|---|---|
| Compound | Concentration (mg/kg) | |
| | 0 - 2 in. | 3.3 - 3.5 ft. |
| Benzo(a)pyrene | 3.5 | 1.2 J |
| Dibenzo(a,h)anthracene | 0.66 J | -- |

Sample Depth

-- Concentration below Part 375 Restricted Use SCO for Commercial Property

J- laboratory estimated value

Overhead Electric/ Telephone

Buried Gas Line (approximate location)

20" dia. Sanitary Sewer

Utility Pole Location

Storm Sewer Pipe

N

20 0 20

SCALE (ft. approximate)

| SB-11 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)anthracene | 13 |
| Chrysene | 12 |
| Benzo(b)fluoranthene | 16 |
| Benzo(a)pyrene | 16 |
| Indeno(1,2,3-c,d)pyrene | 9.5 |
| Dibenzo(a,h)anthracene | 3.3 J |

| SS-3 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 4 in. |
| Benzo(a)pyrene | 1.7 |
| Dibenzo(a,h)anthracene | 0.57 |

| SB-10 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)anthracene | 38 |
| Chrysene | 34 |
| Benzo(b)fluoranthene | 38 |
| Benzo(a)pyrene | 42 |
| Indeno(1,2,3-c,d)pyrene | 25 |
| Dibenzo(a,h)anthracene | 9.4 J |

| SB-9 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)pyrene | 1.4 J |

| SB-19 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Phenanthrene | 1200.0 |
| Fluoranthene | 1500.0 |
| Pyrene | 1200.0 |
| Benzo(a)anthracene | 720.0 |
| Chrysene | 600.0 |
| Benzo(b)fluoranthene | 440.0 |
| Benzo(k)fluoranthene | 590.0 |
| Benzo(a)pyrene | 590.0 |
| Indeno(1,2,3-c,d)pyrene | 300.0 J |
| Dibenzo(a,h)anthracene | 130.0 J |

| SB-6 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 4-6 ft. |
| Benzo(a)pyrene | 3.3 |
| Dibenzo(a,h)anthracene | 0.99 |

| SB05-01 | | |
|---|---|---|
| Compound | Concentration (mg/kg) | |
| | 0 - 2 in. | 3.3 - 3.5 ft. |
| Benzo(a)pyrene | 3.5 | 1.2 J |
| Dibenzo(a,h)anthracene | 0.66 J | -- |

| SB-27 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 18 - 24 in. |
| Phenanthrene | 720.0 |
| Fluoranthene | 1000.0 |
| Pyrene | 990.0 |
| Benzo(a)anthracene | 650.0 |
| Chrysene | 590.0 |
| Benzo(b)fluoranthene | 390.0 |
| Benzo(k)fluoranthene | 520.0 |
| Benzo(a)pyrene | 510.0 |
| Indeno(1,2,3-c,d)pyrene | 300.0 |
| Dibenzo(a,h)anthracene | 110.0J |

| SB-21 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)anthracene | 47.0 |
| Chrysene | 46.0 |
| Benzo(b)fluoranthene | 59.0 |
| Benzo(k)fluoranthene | 54.0 |
| Benzo(a)pyrene | 75.0 |
| Indeno(1,2,3-c,d)pyrene | 60.0 |
| Dibenzo(a,h)anthracene | 21.0 |

| SB-13 | | |
|---|---|---|
| Compound | Concentration (mg/kg) | |
| | 0 - 2 ft. | 4-6 ft. |
| Benzo(a)anthracene | 68 | 21 |
| Chrysene | 56 | 18 |
| Benzo(b)fluoranthene | 45 | 19 |
| Benzo(a)pyrene | 54 | 22 |
| Indeno(1,2,3-c,d)pyrene | 22 | 10 |
| Dibenzo(a,h)anthracene | 9.6 J | 4.1 |

| SS-1R, SS-2, SS-4 |
|---|
| No compounds above SCOs |

| CB-1 |
|---|
| No compounds above SCOs |

| SB-20 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)anthracene | 40.0 |
| Chrysene | 35.0 |
| Benzo(b)fluoranthene | 32.0 |
| Benzo(a)pyrene | 34.0 |
| Indeno(1,2,3-c,d)pyrene | 13.0 |
| Dibenzo(a,h)anthracene | 5.9J |

| SB05-02 | | |
|---|---|---|
| Compound | Concentration (mg/kg) | |
| | 0 - 2 in. | 2 - 3 ft. |
| Benzo(a)anthracene | 27 | -- |
| Benzo(a)pyrene | 22 | 3.9 |
| Benzo(b)fluoranthene | 39 | -- |
| Chrysene | 26 | -- |
| Dibenzo(a,h)anthracene | 4 J | 0.64 J |
| Indeno(1,2,3-c,d)pyrene | 12 | -- |

| SB05-03 | | |
|---|---|---|
| Compound | Concentration (mg/kg) | |
| | 0 - 2 in. | 1.3 - 2.5 ft. |
| Benzo(a)anthracene | -- | 16 |
| Benzo(a)pyrene | -- | 13 |
| Benzo(b)fluoranthene | -- | 17 |
| Chrysene | -- | 14 |
| Dibenzo(a,h)anthracene | -- | 1.7 J |

| SB-15 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)pyrene | 5.2 |
| Dibenzo(a,h)anthracene | 1.2 J |

| SB05-6 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 in. |
| Benzo(a)anthracene | 7.6 |
| Benzo(a)pyrene | 8.8 |
| Benzo(b)fluoranthene | 11.0 |
| Chrysene | 6.5 |
| Dibenzo(a,h)anthracene | 1.4 J |

| SB-25 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(b)fluoranthene | 6.4 |
| Benzo(a)pyrene | 6.9 |
| Dibenzo(a,h)anthracene | 0.93J |

| SB-12 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)anthracene | 48 |
| Chrysene | 43 |
| Benzo(b)fluoranthene | 53 |
| Benzo(a)pyrene | 58 |
| Indeno(1,2,3-c,d)pyrene | 36 |
| Dibenzo(a,h)anthracene | 17 |

| SB-23 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)anthracene | 44.0 |
| Chrysene | 39.0 |
| Benzo(b)fluoranthene | 51.0 |
| Benzo(k)fluoranthene | 64.0 |
| Benzo(a)pyrene | 64.0 |
| Indeno(1,2,3-cd)pyrene | 21.0 |
| Dibenzo(a,h)anthracene | 9.5 J |

| SB-22 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)pyrene | 1.1 J |

| SB-14 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 ft. |
| Benzo(a)anthracene | 56 |
| Chrysene | 50 |
| Benzo(b)fluoranthene | 49 |
| Benzo(a)pyrene | 64 |
| Indeno(1,2,3-c,d)pyrene | 68 |
| Dibenzo(a,h)anthracene | 23 |

| SB05-05 | |
|---|---|
| Compound | Concentration (mg/kg) |
| | 0 - 2 in. |
| No compounds above SCOs | |

| SB05-04 | | |
|---|---|---|
| Compound | Concentration (mg/kg) | |
| | 0 - 2 in. | 1.5 - 3 ft. |
| Benzo(a)pyrene | 5.8 | 2.2 |
| Benzo(b)fluoranthene | 7.4 | -- |
| Dibenzo(a,h)anthracene | 1.6 J | -- |

| SB-26 | | |
|---|---|---|
| Compound | Concentration (mg/kg) | |
| | 0 - 2 in. | 18 - 24 in. |
| Benzo(a)anthracene | 20.0 | 13.0 |
| Chrysene | 19.0 | 13.0 |
| Benzo(b)fluoranthene | 23.0 | 16.0 |
| Benzo(a)pyrene | 25.0 | 17.0 |
| Indeno(1,2,3-c,d)pyrene | 23.0 | 17.0 |
| Dibenzo(a,h)anthracene | 8.2 | 6.9 |

| SB-24 | | |
|---|---|---|
| Compound | Concentration (mg/kg) | |
| | 0 - 2 in. | 18 - 24 in. |
| Pyrene | -- | 52.0 |
| Benzo(a)anthracene | 13.0 | 60.0 |
| Chrysene | 13.0 | 55.0 |
| Benzo(b)fluoranthene | 16.0 | 58.0 |
| Benzo(a)pyrene | 22.0 | 68.0 |
| Indeno(1,2,3-c,d)pyrene | 9.8 | 44.0 |
| Dibenzo(a,h)anthracene | 3.7J | 15.0J |

Manhole

ALTERNATIVE S-3
LIMITED SURFACE/SHALLOW SOIL REMOVED and SOIL COVER
Albion Former MGP Site
Albion, New York

By: MAC | Date: 5/2009 | Project No. 7800.004

AMEC Geomatrix | Figure 10

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## EXPLANATION

- 8-12 ft — MGP Impacted Soil
- Analytical Sample Collection Depth
- B-3 — Geomatrix Soil Boring Location
- SB-8 — S&W Soil Boring Location
- MW-4 — Monitoring Well Location
- Former Gas Holder Location
- Approximate Excavation Limits
- Approximate Deeper Soil Excavation Limits
- Overhead Electric/ Telephone
- Buried Gas Line (approximate location)
- 20" dia. Sanitary Sewer
- Utility Pole Location
- Storm Sewer Pipe

N

20 0 20

SCALE (ft. approximate)

MW-7
MW-3
12-14 ft
12-14 ft
10-12 ft
8-12 ft
8-12 ft
SB-2
SB-5
SB-7
SB-11*
SB-16
SB-10
MW-5/SB-5
SB-28
SB-9
SB-18
SB-17
SB-21
SB-4
SB-20
SB-8
SB-13
SB-3
SB-19
MW-6/SB-6
SB-27
SB-26
SB-12
SB-14
SB-24
SB-23
SB-22
14-16 ft
12-18 ft
SUPP-B-1
SUPP-B-2
SUPP-B-3
SUPP-B-4
SUPP-B-5
SUPP-B-6
SB-15
MW-8
Vault
Control Tower
Ingersoll Street Lift Bridge
Bridge Lift-Structure Pit
FLOW
Manhole
MW-10
S02°52'00"W
181.5'
1 STY. BARN
BUILDING
MW-4
LANDS N/F OF WENDELL & JOAN SMITH (403/256)
2 STY. MASONARY BUILDING
LANDS N/F OF JERRY & ROXANNE WAGNER (412/406)
1 1/2 STY. WOOD FRAME
SIDEWAL K
INGERSOLL STREET
MW-9
N°
47.93'/EL'
SIDEWALK
Manhole
20" diameter Sanitary Sewer (approximate)

ALTERNATIVE S-4
REMOVE SOIL ABOVE UNRESTRICTED USE SCOs
Albion Former MGP Site
Albion, New York

| By: MAC | Date: 11/2007 | Project No. 7800.004 |
|---|---|---|
| AMEC Geomatrix | Figure 11 | |

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