Infrastructure, environment, facilities

FINAL

National Grid

Feasibility Study Report

Fort Plain Former MGP Site
Fort Plain, New York

January 2008

ARCADIS

Certification

I, James M. Nuss, P.E., am a Professional Engineer in the State of New York. To the best of my knowledge, and based on my inquiry of the persons involved in preparing this document under my direction, certify that this *Feasibility Study Report for the Fort Plain Former MGP Site* (Feasibility Study Report) was completed in general accordance with the 2003 Administrative Order on Consent (Index #A4-0473-0000) between National Grid and the New York State Department of Environmental Conservation. This Feasibility Study Report identifies and evaluates potential remedial alternatives to address environmental concerns at the site.

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Feasibility Study Report

Fort Plain Former MGP Site
Fort Plain, New York

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January 2008

Table of Contents

Figures

Tables

Executive Summary

Introduction and Background

This *Feasibility Study Report, Fort Plain Former MGP Site* (Feasibility Study Report) presents the evaluation of remedial alternatives to address environmental media affected by manufactured gas plant (MGP) residuals at National Grid's former MGP site located in the Village of Fort Plain, Montgomery County, New York. The report identifies, screens, and evaluates remedial alternatives that are appropriate for site-specific conditions, protective of human health and the environment, and consistent with applicable laws, regulations and guidance documents.

The Fort Plain former MGP property is located at 14 Hancock Street in the Village of Fort Plain, Montgomery County, New York. The property is rectangular in shape, approximately one-half acre in area, and located within a developed (urbanized) area. The property is bordered on the east by Hancock Street (State Route 5S), on the south by a private residence, on the west by a steep wooded hillside that rises to a narrow wooded park bordering Clinton Avenue, and on the north by a parking lot. The eastern portion of the property, formerly used for MGP operations, is generally level and contains a stone, gravel, and fill material surface, with intermittent vegetation and shrub growth. The property is currently used as an electrical substation. Multiple utility poles containing active transformer banks and overhead transmission and distribution wires exist in the eastern portion of the property.

Groundwater beneath the site flows in a north-northeast direction from the former MGP property towards Otsquago Creek, located approximately 400 feet to the north. The top of the groundwater table occurs in the fill material generally at a depth of approximately 4 to 6 feet bgs across most of the former MGP property. Depth to groundwater at wells located across Hancock Street ranged between 16 and 18 feet bgs. Groundwater at or in the vicinity of the site is not used as a source for drinking water.

The primary MGP-related impacts associated with the site is a dark colored, somewhat viscous, oil-like material, which is a dense non-aqueous phase liquid (DNAPL). DNAPLs are heavier than water if present in sufficient quantities. The oil-like material contains many organic compounds that are regulated by the NYSDEC. Chief among these are benzene, toluene, ethylbenzene, and xylenes (BTEX), and a more general class of organic compounds called polycyclic aromatic hydrocarbons (PAHs). The nature and extent of MGP-related impacts in soil and groundwater at the site has been delineated. Most of the MGP impacts, including NAPL, were located within, or in close proximity to, the former northern gas holder on the former MGP property. Soil containing elevated PAHs, visible sheens, stains, and NAPL were encountered between 2 to 16 feet bgs in this area. Specifically, most of these impacts appeared to be within, or adjacent to the northern holder. Visible evidence of sheens and staining were also observed in approximately 16 soil borings installed in the restaurant parking lot located to the east of the site across Hancock Street. These off-site impacts appear to be limited to a relatively thin zone, present from approximately 15 to 21 feet bgs. As confirmed by the NYSDEC approval of the remedial investigation, subsurface soil and groundwater impacts have been adequately delineated.

As presented in the NYSDEC-approved Remedial Investigation Report (RI Report), a human health exposure assessment (HHEA) was conducted and concluded that:

- Under current use and daily operations, 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 ingestion, dermal contact and inhalation).

- 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. Human exposure to impacted groundwater is greatest during construction/ excavation activities (e.g., maintenance of underground utilities).

The potential exposure of construction workers to impacted soil and groundwater would be mitigated by using properly trained personnel, engineering and administrative controls and appropriate personal protective equipment.

Remedial Action Objectives

The Feasibility Study presents the remedial action objectives (RAOs) for the impacted media that have been identified within the site. These RAOs represent medium-specific goals that are protective of human health and the environment (USEPA, 1988; NYSDEC, 2002). These objectives are developed by considering the results of the qualitative HHEA with reference to potential regulatory standards, criteria, and guidance (SCGs) identified for the site.

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

- contact with, or inhalation of MGP-related constituents of concern (COCs) in soil or groundwater
- ingestion of MGP-related COCs in soil
- the source of MGP-related groundwater impacts
- migration of MGP-related COCs that would result in groundwater impacts

In addition, the RAOs for the site include improving groundwater quality where impacted by MGP operations, achieving groundwater standards to the extent practicable.

Remedial Alternatives

<u>Subsurface Soil</u>

Five remedial alternatives, labeled SM1 through SM5, were identified to address the RAOs for subsurface soil at the site. In keeping with NCP and USEPA requirements, Alternative SM1, No Further Action, is provided in the detailed evaluation as a basis for comparison for the other alternatives. Four additional alternatives include excavation of subsurface soil based on increasing limits of excavation, as follows:

- Alternative SM2 – Remove Contents of Northern Gas Holder; includes removal of the contents of the northern gas holder and removal of MGP-impacted material from the former MGP property above the top of groundwater, to the extent practicable.
- Alternative SM3 – Remove Northern Gas Holder and MGP-Impacted Material Above Confining Layer on former MGP Property; includes removal of the northern gas holder and its contents, and removal of MGP-impacted material from the former MGP property above a silt and clay confining layer that exists at approximately 13 to 18 feet below ground surface (bgs), to the extent practicable.
- Alternative SM4 – Remove Northern Gas Holder and Soil Above 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use; includes removal of the northern gasholder and its contents, and removal of soil above 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for commercial use, to the extent practicable.

- Alternative SM5 – Remove Northern and Southern Gas Holders and Soil Exceeding 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives from the Former MGP Property includes removal of both the northern and southern gas holders and their contents in addition to soil on the former MGP property with MGP-related impacts greater than 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives.

Groundwater

Three remedial alternatives, labeled GW1 through GW3, were developed for addressing impacted groundwater at the Fort Plain site. In keeping with NCP and USEPA requirements, Alternative GW1, No Further Action, is provided in the detailed evaluation as a basis for comparison for the other alternatives. Two additional alternatives include:

- Alternative GW2 – Monitored Natural Attenuation (MNA); includes monitoring to document naturally-occurring chemical, biological, and/or physical processes that effect the toxicity, mobility, concentration, mass, or volume of the MGP constituent dissolved in groundwater.

- Alternative GW3 – Enhanced MNA; includes the application of an oxygen-releasing compound and/or other amendments (e.g., nutrients) to the groundwater via vertical wells to stimulate growth of indigenous bacteria and enhance the degradation of dissolved MGP residuals. Application wells would be installed on the former MGP property and east of Hancock Street in the restaurant parking area.

Following development of the remedial alternatives identified above, each alternative underwent a detailed evaluation which considered the following seven evaluation criteria developed and defined by the USEPA and NYSDEC:

- 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

Following completion of the detailed evaluation of each remedial alternative, a comparative analysis using the above seven evaluation criteria was completed. The comparative analysis identifies the advantages and disadvantages of each alternative relative to each other and with respect to the seven criteria. The results of the comparative analysis were used as a basis for recommending the preferred soil and groundwater remedial alternatives for addressing the RAOs identified for the site.

Selection of Preferred Alternatives

Subsurface Soil

Alternative SM3 was selected as the preferred remedial alternative. Alternative SM3 would cost-effectively achieve the best balance of the seven NYSDEC evaluation criteria and would achieve the RAOs developed for this medium in a reasonable timeframe. This remedy represents a permanent reduction in the toxicity, mobility, and volume of MGP-impacted material representing the greatest impacts both in the saturated and unsaturated zones by excavation and removal.

Alternative SM3 includes the following primary components:

- Removal of the northern gas holder and it contents to eliminate potential sources of impacts to subsurface soil.
- Excavation and removal of heavily MGP-impacted material from the former MGP property above the silt and clay confining layer, to the extent practicable.
- Off-site treatment and disposal of the excavated material.
- Addition of an oxygen-releasing compound and/or other suitable treatment amendments (e.g., nutrients) to the backfill material that is used below the groundwater table to stimulate growth of indigenous bacteria and enhance the degradation of dissolved MGP residuals.

- Site restoration, including installing and maintaining a stone surface cover on the former MGP property to reduce, to the extent practicable, exposure to COCs.

- Institutional controls to reduce potential exposure to COCs remaining at the site.

Alternative SM3 was selected rather than Alternatives SM2 and SM4 because it:

- Removes approximately 80 percent of the heavily MGP-impacted material from the former MGP

- Requires only a minimal amount of additional time to implement compared to Alternative SM2 and significantly less time to implement than Alternative SM4; therefore, Alternatives SM2 and SM3 represent similar short-term impacts/disruptions to the community (including the duration for the closure of Hancock Street), which are significantly less than Alternative SM4

- Represents a smaller contribution to greenhouse gases than Alternative SM4 (i.e., smaller carbon footprint) and only an incremental amount more than Alternative SM2

- Has a significantly higher level of implementability than Alternative SM4

- Has an equivalent long-term effectiveness compared to Alternatives SM2 and SM4

- Represents an equivalent overall protection to human health and the environment (no current exposures exist to impacted soil or groundwater).

- Achieves the RAOs at the most reasonable cost.

<u>Groundwater</u>

Alternative GW3 was selected as the preferred remedial alternative. Alternative GW3 would achieve the best balance of the seven evaluation criteria and further mitigate the potential for human exposure to impacted groundwater. Alternative GW3 includes the following primary components:

- Monitor groundwater for a period of 5 years after the proposed soil removal component is completed through a scheduled sampling program to document groundwater conditions and the ongoing natural attenuation of dissolved COCs.

- Following the initial 5 year monitoring period, groundwater data would be evaluated, and bench-scale and field pilot testing would be conducted to design and install an appropriate well system for the application of an oxygen releasing system.

- Monitor the oxygen enhanced natural degradation of groundwater for a period of 5 years to evaluate the effectiveness of the remedy; based on the results, propose additional operation, modification, or discontinuation of the application of oxygen

- Implement institutional controls that would place health and safety requirements on subsurface intrusion activities and groundwater extraction within the site.

Alternative GW3 achieves the groundwater RAOs with a moderate level of short-term and long-term impacts and implementability concerns, and documents the reduction in toxicity, mobility, and volume of MGP impacts, and is cost-effective. The effectiveness of this alternative is anticipated to be increased when combined with the recommended subsurface soil alternative.

<u>Preferred Alternative Cost Estimate</u>

Alternative	Estimated Capital Cost (rounded)	Estimated Present Worth O&M Cost (rounded)	Estimated Total Cost (rounded)
GW3	$ 550,000	$ 965,000	$ 1,520,000
SM3	$ 2,400,000	$ 120,000	$ 2,520,000
Total Present Worth Cost Estimate			$ 4,040,000

Acronyms and Abbreviations

ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAMP	Community Air Monitoring Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	constituent(s) of concern
CFR	Code of Federal Regulations
CWA	Clean Water Act
cy	Cubic Yards
DER	Division of Environmental Remediation
DUS/HPO	Dynamic Underground Stripping and Hydrous Pyrolysis/Oxidation
DNAPL	dense non-aqueous phase liquid
ECL	Environmental Conservation Law
FWIA	Fish and Wildlife Impact Analysis
GRAs	General Response Actions
HASP	Health and Safety Plan
HHEA	human health exposure assessment
IRM	Interim Remedial Measure
LDR	Land Disposal Restriction
LTTD	Low-Temperature Thermal Desorption

MGP	Manufactured Gas Plant
MNA	Monitored Natural Attenuation
MVS	Mining Visualization System
NAPL	non-aqueous phase liquid
NCP	National Contingency Plan
NYCRR	New York State Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PDI	Pre-Design Investigation
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
PRAP	Proposed Remedial Action Plan
PSA/IRM	Preliminary Site Assessment/Interim Remedial Measures
PVC	Polyvinyl Chloride
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
SCGs	Standards Criteria and Guidelines

TAGM	Technical and Administrative Guidance Memorandum
TCLP	Toxicity Characteristic Leaching Procedure
TOGS	Technical and Operational Guidance Series
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency
UTS/LDR	Universal Treatment Standard/Land Disposal Restriction
VOCs	Volatile organic compounds

1. Introduction

1.1 General

This *Feasibility Study Report, Fort Plain Former MGP Site* (Feasibility Study Report), prepared by ARCADIS on behalf of National Grid, presents the evaluation of remedial alternatives to address environmental media affected by manufactured gas plant (MGP) residuals at National Grid's former MGP site located in the Village of Fort Plain, Montgomery County, New York. The report identifies, screens, and evaluates remedial alternatives that are appropriate for site-specific conditions, protective of human health and the environment, and consistent with applicable laws, regulations and guidance documents. Based on this evaluation, a recommended remedial alternative for the site is presented.

1.2 Regulatory Framework

Prior to 1998, Niagara Mohawk (now National Grid) entered into an Administrative Order on Consent (Index #DO-001-9210) (Order) with the New York State Department of Environmental Conservation (NYSDEC). The Order required National Grid to investigate and, where necessary, remediate former MGP sites in New York State. The Fort Plain site was among the sites included in the Order. Niagara Mohawk initiated environmental investigations at the Fort Plain former MGP site in 1998. In March 2003, Niagara Mohawk entered into a new Order (Index #A4-0473-0000) (2003 Order) that identified former MGP sites requiring remedial action. Section II of the 2003 Order requires that National Grid prepare a feasibility study to, at a minimum, evaluate on-site and off-site remedial actions to eliminate or mitigate significant threats to public health and the environment.

This Feasibility Study Report was prepared in accordance with the 2003 Order, as well as relevant sections of the following documents:

- *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (Interim Final), United States Environmental Protection Agency. EPA/540/G-89/004. October 1988.

- *National Oil and Hazardous Substances Pollution Contingency Plan Under the Comprehensive Environmental Response, Compensation and Liability Act of 1980* (NCP). Applicable provisions contained in the Code of Federal Regulations (40 CFR Part 300). September 15, 1994.

- *Code of Federal Regulations: Protection of Environment*. 40 CFR. United States Environmental Protection Agency (USEPA). March 8, 1990. Revised July 1, 1990.

- *Selection of Remedial Actions at Inactive Hazardous Waste Sites*. NYSDEC Division of Hazardous Waste Remediation (HWR), Technical and Administrative Guidance Memorandum (TAGM; TAGM HWR-4030). May 15, 1990.

- *Guidelines for Remedial Investigations/Feasibility Studies*. NYSDEC Division of HWR, TAGM HWR-4025. March 31, 1989.

- *Environmental Remediation Programs*. NYSDEC, Division of Environmental Remediation, 6NYCRR Part 375. November 14, 2006.

The remedial investigation of the Fort Plain former MGP site and adjacent properties was also conducted consistent with the data requirements and guidance for developing soil cleanup objectives presented in the NYSDEC TAGM 4046, *Determination of Soil Cleanup Objectives and Cleanup Levels* (January 24, 2994). In December 2006, the NYSDEC's Environmental Remediation Program (6 NYCRR Part 375) replaced TAGM 4046. However, the objectives of both programs are consistent, and the remedial investigation that was completed prior to adoption of 6 NYCRR Part 375 is considered complete, and the nature and extent of impacts associated with the former MGP site have been adequately defined.

1.3 Report Organization

The Feasibility Study Report is organized into the following sections:

Section	Description
1 – Introduction	Presents the purpose and the regulatory framework governing the preparation of this Feasibility Study Report, describes the organization of the report, and summarizes relevant background information and findings of site investigations.
2 – Identification of Potential Standards, Criteria, and Guidelines	Identifies the potential Standards, Criteria, and Guidelines (SCGs) that govern the development and selection of remedial alternatives.
3 – Development of Remedial Action Objectives	Presents the remedial action objectives (RAOs) for the site that are protective of human health and the environment, and identifies media to be addressed through implementation of the remedial alternatives.

Section	Description
4 – Technology Screening Summary and Development of Remedial Alternatives	Identifies and screens remedial technologies and process options, and develops potential remedial alternatives to address impacted media.
5 – Detailed Evaluation of Remedial Alternatives	Describes the NYSDEC and NCP criteria used to evaluate the remedial alternatives, and presents a detailed analysis of each remedial alternative for each media.
6 – Comparative Analysis of Remedial Alternatives	Presents a comparative analysis of each of the remedial alternatives using the evaluation criteria.
7 – Selection of Preferred Alternatives	Presents the recommended remedial alternative for each impacted media at the site.
8 – References	Lists reports, documents, and other literature referenced in this Feasibility Study Report.

1.4 Background

This section summarizes the site-specific background information used to develop and evaluate remedial alternatives for the site, including:

- Site location and physical setting
- Site history
- Previous investigations conducted at the site
- Geology and groundwater flow

For clarity throughout this Feasibility Study Report, the property currently owned by National Grid that was formerly used for MGP operations is referred to as the “former MGP property”. Where used in this document, the term “site” refers to the entire area that was investigated during the remedial investigation, including the former MGP property and surrounding properties.

1.4.1 Site Location and Physical Setting

The Fort Plain former MGP property is located at 14 Hancock Street in the Village of Fort Plain, Montgomery County, New York (Figure 1-1). The property is rectangular in shape, approximately one-half acre in area, and located within a developed (urbanized) area. The property is bordered on the east by Hancock Street (State Route 5S), on the south by a private residence, on the west by a steep wooded hillside that rises to a narrow wooded park bordering Clinton Avenue, and on the north by a parking lot. A 6-foot-high chain link fence with a locked access gate that is maintained by National Grid secures the property. The eastern portion of the property, formerly used for MGP operations, is generally level and contains a stone, gravel, and fill material surface, with intermittent vegetation and shrub growth. An old stone wall/foundation is located near the south end of the property. The property is currently used as an electrical substation. Multiple utility poles containing two active transformer banks and overhead transmission and distribution wires exist in the eastern portion of the property.

Photograph shows eastern portion of site, looking south towards electric substation.

The remnants of two gas holders that were part of the former MGP operations exist below the ground surface, along with an at-grade concrete slab associated with a former building (Figure 1-2). The former gas holders were located using test pits during investigation activities. The former northern holder was determined to be approximately 30 feet in diameter with its east wall approximately 10 feet from the western curb of Hancock Street. The bottom of the holder was encountered at approximately 9.5 feet below ground surface (bgs). The bottom of the southern gas holder is located at approximately 6.5 feet bgs.

According to historical maps and discussions with the former historian for the Village of Fort Plain, the former Erie Canal was located parallel to and approximately 10 to 20 feet east of Hancock Street. The canal was filled in with rip-rap, fill dirt, and other available materials (e.g., wood) during the early 1900s. Otsquago Creek is located approximately 300 feet north of the site and flows to the northeast, eventually reaching the Mohawk River approximately 1,200 feet northeast of the site.

1.4.2 Site History

A chronological history of the former MGP property and surrounding area is presented in the *Preliminary Site Assessment/Interim Remedial Measures (PSA/IRM) Study* (February 1998) (PSA Report), and summarized below.

Gas operations at the former MGP property date back to 1868. By 1891, Sanborn Fire Insurance maps indicate that a water gas plant and an associated "gasometer" were present. The location of this former gasometer correlates with the location of the southern gas holder shown on Figure 1-2. The MGP used coal and petroleum to manufacture gas for heating and lighting local homes and businesses. By 1901, a Sanborn map indicates that a gas holder is located at the north end of the property, within a single site building. This gas holder appears to be the one depicted as the former northern gas holder (Figure 1-2). In addition, a coal storage shed, generators, electrical transformers, and repair shop were present. The configuration of the structures remained relatively the same on the 1906 Sanborn map. By 1912, an electric transformer house had been added to the north end of the gas plant. Between 1912 and 1919, the portion of the Erie Canal located adjacent to the site had been filled. Sanborn maps from 1926 indicate that the site configuration had changed, and the gasometer and northern gas holder were no longer shown. However, a 1927 site map shows the gasometer and gas holder still present on the property. By 1935, all of the gas buildings had been removed from the property. By 1952, the site was referred to as a Niagara Mohawk (now operating as National Grid) substation and only the transformer building and vacant substation building remained. From the mid-1800s through the mid-1950s, the land use north and east of the former MGP property was generally used for commercial/industrial activities, including a foundry to the north, and auto repair, welding, machine shops, and laundry to the east.

In 1994, the New York State Department of Transportation (NYSDOT) rebuilt Hancock Street in the area of the former MGP property. In addition, a 6-inch-diameter underdrain was installed south of the former MGP property to intersect and divert drainage from the steep hill that previously ran through the property. In 1996, the former transformer building was demolished down to the foundation.

1.4.3 Summary of Previous Investigations

Several environmental investigations and other studies have been performed starting in 1998. A *Remedial Investigation (RI) Report, Niagara Mohawk, Fort Plain Former MGP Site (revised)* was submitted to the NYSDEC in May 2004. Several subsequent investigations were conducted to further define the extent of impacts at the site, to evaluate the potential presence of subsurface soil vapors, and to collect additional data to support preparation of the feasibility study. With the NYSDEC's January 22, 2007 letter correspondence indicating that the soil vapor pathway investigation was completed, no further soil vapor investigation was required, and the remedial investigation portion of the project was completed. The letter further requested that National Grid proceed with preparation of the Feasibility Study for the site.

The primary objectives of the remedial investigations were to:

- define the nature and extent of impacts to the environment from the former MGP operations
- evaluate the risk posed to human health and the environment by those impacts
- collect sufficient information to evaluate potential remedial strategies

During these investigations, approximately 27 soil borings and/or monitoring wells and 10 test pits were installed on the former MGP property. In addition, approximately 35 soil borings and/or monitoring wells were installed off-site (primarily east) of the former MGP property. Hundreds of samples of environmental media were collected and sent to independent laboratories for analysis.

A list of the previous investigation reports is provided in Section 8. Relevant information collected during these investigations was used during the development of this Feasibility Study and evaluation of remedial alternatives. A summary of the results from the remedial investigation program is presented below.

1.4.4 Geology and Groundwater Flow

The following paragraphs summarize the geology and groundwater flow characteristics at the site.

Geologic Units

Subsurface investigations have identified four principle geologic units beneath the former MGP property. In order of increasing depth from the ground surface, these geologic units include:

- Heterogeneous fill material consisting primarily of a mixture of gravel, sand, and silt ranging in thickness from approximately 6 to 18 feet. In areas on the former MGP site, the fill also contained a variety of materials, including brick,

Thickness (ft)	Stratigraphic Unit
6 - 18	**Fill**- consisting of gravel, sand, and silt. Encountered from grade to depths ranging from 6 – 18 ft bgs. Brick, concrete, and construction debris were present in this unit on the former MGP property
4 - 6	**Native silt and clay** - confining layer encountered between 13 – 18 ft bgs; becomes thinner and deeper to the east and northeast.
5 - 10	**Native sand and gravel** – thin unit that also dips and becomes thinner to the northeast.
13 - 20	**Native Silt and Clay**- dense confining layer encountered across the site at depths from 13 to 20 ft bgs

Thicknesses approximated for center of former MGP site concrete, well-graded to silty gravel, well-sorted to silty sand with gravel, and silt with gravel and/or sand, and an assortment of man-made structures, originating from the property's and surrounding area's industrial history.

- Native silt and clay formation characterized as a confining layer. The native yellow/ brown/dark gray silt and clay formation was generally encountered between 13 to 18 feet bgs across the former MGP property. The depth of the silt and clay contact generally becomes thinner and deeper further to the east and northeast.

- Native brown/gray fine to coarse sand and gravel formation generally encountered from 16 to 20 feet bgs beneath the silt and clay formation. The depth of the sand and gravel contact also became thinner and deeper further to the east and northeast.

- Dense, olive/gray/brown silt confining layer that was encountered in all soil borings at approximately 18 to 21 feet bgs.

The geologic sequence was also observed across the site (i.e., at soil boring/monitoring well locations off the former MGP property), with the depth of the native silt and clay contact generally becoming deeper further to the northeast.

A silt and clay fill layer was observed in soil borings installed east of the former MGP property in the parking area of the restaurant at approximately 10 feet bgs above the native silt and clay formation. This fill layer likely represents the former Erie Canal sub-base.

Geologic information collected during the multiple investigations was included in a site data base, and a 3-dimensional visualization model of the site geology was prepared using Mining Visualization System (MVS) computer software platform. The MVS software package combines a data visualization platform and geostatistical numerical model. Cross-sections depicting the stratigraphic units using the MVS software are presented on Figure 1-3.

Groundwater Occurrence and Flow

Groundwater beneath the site flows in a north-northeast direction from the former MGP property towards Otsquago Creek, located approximately 400 feet to the north. The top of the groundwater table occurs in the fill material generally at a depth of approximately 4 to 6 feet bgs across most of the former MGP property. Depth to groundwater increases to the north and east to depths of 16 to 18 feet bgs at the north end of the former MGP property

(MW-3). Depth to groundwater at wells located across Hancock Street ranged between 16 and 18 feet bgs.

Hydraulic gradients ranging from 0.09 to 0.20 (unitless) were observed during the remedial investigations. Groundwater data collected during multiple phases of the investigation indicated a consistent flow pattern.

1.5 Nature and Extent of Impacts

The primary MGP-related impacts associated with the site is a dark colored, somewhat viscous, oil-like material, which is a dense non-aqueous phase liquid (DNAPL). DNAPLs are heavier than water if present in sufficient quantities. The oil-like material contains many organic compounds that are regulated by the NYSDEC. Chief among these are benzene, toluene, ethylbenzene, and xylenes (BTEX), and a more general class of organic compounds called polycyclic aromatic hydrocarbons (PAHs). The nature and extent of MGP-related impacts that have been observed in soil and groundwater at the site is summarized below.

As mentioned in Section 1.2, the remedial investigation was developed consistent with the remediation data requirements of TAGM 4046. With its adoption in December 2006, 6NYCRR Part 375 replaced TAGM 4046 and provides soil cleanup objectives that are protective of human health and the environment based on current and foreseeable future use of the subject property. The foreseeable use of the former MGP property and properties located to the east of Hancock Street are commercial; therefore, 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for protection of public health for commercial use are considered for this Feasibility Study Report.

1.5.1 Surface Soil

Four surface soil samples (0 to 2-inches bgs) were collected from the former MGP property and surrounding area for laboratory analysis during the preliminary site investigation conducted in 1997

Volatile organic compounds (VOCs) were not detected in the surface soil samples collected from the former MGP property. A large number of PAH compounds were detected in the surface soil samples collected from both the former MGP property and the background samples above health based cleanup objectives specified in TAGM 4046 (it is noted that these cleanup objectives are based on long-term chronic exposure, and accordingly are only relevant in cases where a long-term residential exposure scenario applies). A human health exposure assessment was conducted during the remedial investigation using the surface soil data. The results of the human health exposure assessment presented in the NYSDEC-approved Remedial Investigation Report (2003) concluded that a potentially complete exposure pathway for on-site surface soil was very unlikely under existing site conditions (including perimeter fencing, the “No Trespassing” signs, and the stone-gravel cover materials). Additionally, the human health exposure assessment concluded that there was no current exposure pathways associated with surface soil east of the former MGP property; off-site areas are almost completely paved with asphalt or concrete.

Based on the results presented in the human health exposure assessment, the lack of complete exposure pathways, and continued use of the former MGP property as a utility substation for the foreseeable future, evaluation of remedial alternatives for surface soil as a separate media was not conducted in this Feasibility Study Report.

1.5.2 Subsurface Soil

MGP-related impacts to subsurface soil within the site consist primarily of PAHs and VOCs. Most of the residual MGP impacts, including NAPL, were located within, or in close proximity to, the former northern gas holder on the former MGP property. Soil containing elevated concentrations of PAHs, visible sheens, stains, and NAPL were encountered between 2 to 16 feet bgs in this area. Specifically, most of these impacts appeared to be within, or adjacent to the northern holder. Heavy sheens and an “oil-like material” were also observed within the southern gas holder immediately above the holder floor.

Visible evidence of sheens and staining were observed in approximately 16 soil borings installed in the restaurant parking lot located to the east of the site across Hancock Street. These off-site impacts appear to be limited to a relatively thin zone, present from approximately 15 to 21 feet bgs, and located immediately above the silt and clay confining layer. Review of the soil boring logs for these locations indicated that at most of the locations the field observations were described as stains and/or sheens rather than NAPL and/or saturated soil.

As confirmed by the NYSDEC approval of the remedial investigation phase of the project, soil containing staining, sheens, and/or NAPL are adequately delineated. Four angled borings were installed at the toe of the slope located immediately west of the former MGP operations. Observations from these borings indicate that there was no evidence of significant MGP-related impacts under the hillside on the western side of the site. Data from a soil boring installed on the property located immediately south of the MGP property indicated that no exceedances of regulatory criteria were observed. The northern extent of soil impacts is defined by monitoring well MW-3, as no regulatory criteria were exceeded in soil samples collected from 8 to 10 feet bgs and 18 to 20 feet bgs. Visual and chemical information from all of the subsurface investigations was input uploaded into the project database, and the MVS software was used to develop a model identifying the extent of soil containing sheens and/or NAPL. For the purposes of this Feasibility Study Report, "MGP-impacted material" that is identified for removal as part of a remedial alternative refers to materials containing visual evidence of MGP coal tar, NAPL-saturated soil, heavily impacted soil, and/or heavy sheens. The extent of soil containing heavy sheens and/or NAPL that exists outside the former gas holders at the site is depicted on Figure 1-4.

A total of 11 monitoring wells and one recovery well have been installed during the environmental investigations conducted within the site. NAPL has not accumulated in any of the monitoring wells installed on the former MGP property or downgradient (east) of Hancock Street. Note that recovery well RW-1 was installed in the area identified as having the most significant visual MGP-related impacts (located between monitoring well MW-10 and temporary well TW-2). As indicated in Section 5.4 (NAPL Recovery Potential) of the NYSDEC-approved *Preliminary Site Assessment (Phase III)/Interim Remedial Measures Study Report* (Phase III Report) (February 2002), recovery well RW-1 was installed to recover NAPL that was observed in soil boring SB-10. MGP-impacted soils were observed in samples collected from the soil boring associated with the recovery well; however, NAPL has not been observed in the well 2001. Additionally, temporary well TW-2 was installed immediately northwest of soil boring SB-10 as part of the Phase III investigation. Descriptions of the soil borings from this well included "thick black, viscous, oil-like material" identified at 19 feet below grade (immediately above the confining silt layer). Although temporary well TW-2 was not equipped with a sump, it was installed to the top of the confining silt layer that contained heavily MGP-impacted soils. Accumulation of NAPL was not observed in temporary well TW-2.

The absence of NAPL in recovery well RW-1 and temporary well TW-2 indicates that NAPL was not recoverable and suggests that, although historically MGP-related NAPL migrated from the former MGP property (gas operations occurred circa 1868 to 1935), the NAPL, in its residual weathered state, has limited overall mobility. Mobile NAPL; therefore, is not considered to be present at the site.

1.5.3 Groundwater

The nature and extent of MGP-related impacts to groundwater at the site have been characterized. Groundwater sampling has been conducted since 1997; however, additional wells were installed during multiple phases of investigation of the site, including three downgradient wells (monitoring wells MW-9, MW-10, and MW-11) installed in July 2003.

For the purposes of this Feasibility Study Report, impacted groundwater is defined as groundwater containing MGP-related constituents (BTEX and PAHs) above NYSDEC Class GA Standards and Guidance Values (i.e., drinking water standards). This definition is used even though water in the area is not used as a source for drinking water. The location of the dissolved BTEX and PAHs extends from the former MGP site to the parking area located east of State Street. The greatest concentrations of dissolved impacts were detected in monitoring wells MW-4 (located adjacent to the northern gas holder) and MW-10 (located in the parking area south of the restaurant). The most recent groundwater data is presented on Figures 1-5 and 1-6. The extent of dissolved BTEX and PAHs are delineated; BTEX and PAHs have not been detected in groundwater from upgradient monitoring well MW-1, in cross-gradient monitoring wells MW-2 and MW-3, or in downgradient monitoring wells MW-5, MW-8, MW-9, or MW-11. The location of impacted groundwater is generally consistent with locations where soil was observed to contain sheens and/or NAPL impacts. Based on these observations, the extent of dissolved BTEX and PAHs has not migrated far from the heavily MGP-impacted material. Historical groundwater monitoring data is presented in Table 1-1.

As shown by monitoring wells MW-10 and MW-11, the hydraulically downgradient edge of the dissolved phase constituents does not appear to be migrating. Concentrations of BTEX within groundwater samples collected from MW-10 have decreased in concentration from approximately 410 micrograms per liter (μg/L) in 2004, to 187 μg/L in 2005, to 160 μg/L in 2007. Similarly, concentrations of total PAHs have decreased from 569 μg/L to 130 μg/L over a 4-year period (2003 to 2007). In a groundwater sample collected from monitoring MW-9 in 2003 (hydraulically downgradient from monitoring well MW-10), 3 μg/L of total PAHs were detected; in two subsequent sampling events (2004 and 2007), total PAHs were not detected.

In addition, based on the geochemical data collected during the July 2007 groundwater sampling event, reducing conditions (i.e., lower dissolved oxygen concentrations) generally existed in groundwater in areas where greater concentrations of BTEX and PAHs were present (monitoring wells MW-3, MW-4, MW-7, and MW-10). Dissolved iron and manganese were detected at elevated concentrations at these locations; methane was present and nitrate was absent. Aerobic or mildly reducing conditions were present in groundwater collected from monitoring wells MW-8, MW-9, and MW-11; dissolved iron was not present, methane was not detected, and concentrations of sulfate were elevated. This data, as well as the low to non-detectable concentrations of BTEX and PAHs present in monitoring wells MW-8, MW-9, and MW-11, indicates that natural attenuation and biodegradation processes are active and, at minimum, have been effective components in controlling downgradient migration of the edge of the dissolved phase constituents (i.e., stabilizing plume migration).

The depth, orientation, and configuration of the remnant Erie Canal does not appear to have a relationship with the migration of MGP impacts (Stearns & Wheeler, 1998). The fill material of the canal appears to be similar to the other fill material across the area, suggesting that a preferential pathway for migration does not exist.

1.5.4 Soil Vapor

Pursuant to a NYSDEC- and NYSDOH-approved work plan, soil vapor sampling was conducted at the Fort Plain site in March 2005 to:

- Evaluate the presence/absence of MGP-related soil vapors on the former MGP parcel in the area possessing the highest known concentrations of MGP-related residuals.

- Evaluate the presence/absence of MGP-related soil vapors adjacent to the boundaries of the former MGP parcel.

- Evaluate the presence/absence of MGP-related soil vapors at the parcel used as a commercial business (restaurant) east of Hancock Street in an area known to possess MGP-related hydrocarbons.

The analytical results from the soil vapor sampling were presented in the *Soil Vapor Evaluation Report* (ARCADIS, 2006). The results from the soil vapor sampling were compared to both the screening values presented in the USEPA's *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (OSWER, November 2002) and the NYSDOH Sub-Slab Action levels presented in the draft *Guidance for Evaluating Soil Vapor in the State of New York* (New York State Department of Health (NYSDOH, 2005). The draft guidance was used as a screening tool to evaluate if detected vapors pose an unacceptable risk to human health.

Analytes that were detected in soil vapors collected from both on-site and off-site locations were present at concentrations 2 to 3 orders of magnitude below USEPA and NYSDOH screening values, or at ambient air concentrations. Based on these results, the NYSDEC indicated, in a letter correspondence dated January 22, 2007, that the soil vapor intrusion pathway has been satisfactorily investigated, and that no further investigation was required.

Under current use, potential exposure pathways for soil vapor from MGP-related impacts do not exist either on the former MGP site or east of the site. As such, evaluation of remedial technologies to address soil vapor were not required for this Feasibility Study Report.

2. Identification of Potential Standards, Criteria, and Guidelines

2.1 General

As previously presented, this Feasibility Study Report was prepared in general conformance with the applicable provisions of the New York State Environmental Conservation Law (ECL), the CFR, and the NCP, and guidelines set forth in TAGM HWR 4025, and TAGM HWR 4030. This section identifies the potential standards, criteria and guidelines (SCGs) that have been identified for the site.

2.1.1 Definition of SCGs

"Standards and criteria" are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations that are generally applicable, consistently applied, and officially promulgated under federal or state law that are either directly applicable or relevant and appropriate to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances.

"Guidelines" are non-promulgated criteria that are not legal requirements and do not have the same status as "standards and criteria;" however, remedial programs should be designed with consideration given to guidelines that, based on professional judgment, are determined to be applicable to the project [6 NYCRR Part 375-1.10(c)(1)(ii) of Title 6 of the New York Compilation of Codes, Rules, and Regulations (6 NYCRR 375-1.10(c)(1)(ii))].

2.1.2 Types of SCGs

NYSDEC has provided guidance on applying the SCG concept to the remedial investigation/feasibility study (RI/FS) process. In accordance with NYSDEC guidance, SCGs are to be progressively identified and applied on a site-specific basis as the RI/FS proceeds. The SCGs considered for the potential remedial alternatives identified in this Feasibility Study Report were categorized into the following classifications:

- ***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 the acceptable amount or concentration of chemical constituents that may be found in, or discharged to, the ambient environment.

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

- ***Location-Specific SCGs*** – These SCGs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in specific locations.

2.2 SCGs

The SCGs identified for the evaluation of remedial alternatives are presented below.

2.2.1 Chemical-Specific SCGs

The potential chemical-specific SCGs for the site are summarized in Table 2-1. Chemical-specific SCGs that potentially apply to the waste materials generated during remedial activities are the Resource Conservation and Recovery Act (RCRA) and New York State regulations regarding the identification and listing of hazardous wastes outlined in 40 CFR 261 and 6 NYCRR Part 371. Included in these regulations are the regulated levels for the Toxicity Characteristic Leaching Procedure (TCLP) constituents. The TCLP constituent levels are a set of numerical criteria at which solid waste is considered a hazardous waste by the characteristic of toxicity. In addition, the hazardous characteristics of ignitability, reactivity, and corrosivity may also apply, depending upon the results of waste characterization activities. Additionally, the NYSDEC's Soil Cleanup Objectives presented in 6NYCRR Part 375 are applicable for chemical constituents in soil at the site.

Although groundwater in the area of the site is not used for drinking water, it is subject to the NYSDEC Class GA Groundwater Standards defined in 6 NYCRR Parts 700-705. These standards identify acceptable levels of constituents in groundwater based on potable use. The Class GA Groundwater Standards and guidance values are also presented in the NYSDEC document entitled, *Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (TOGS 1.1.1). TOGS 1.1.1 also provides a compilation of guidance values for use where there are no standards (NYSDEC, reissued June 1998 and addended April 2000).

2.2.2 Action-Specific SCGs

The potential action-specific SCGs for this site are summarized in Table 2-2. Action-specific SCGs include general health and safety requirements and general requirements regarding handling and disposing of hazardous waste (including transportation and disposal, permitting, manifesting, disposal and treatment facilities).

One set of potential action-specific SCGs for the site consists of the land disposal restrictions (LDRs), which regulate land disposal of hazardous wastes. The LDRs are applicable to alternatives involving the disposal of hazardous waste (if any). Because MGP wastes resulted from historical operations conducted prior to the passage of RCRA, MGP-impacted material is only considered a hazardous waste in New York if it is removed (generated) and it exhibits a characteristic of a hazardous waste. However, if the MGP-impacted material only exhibits the hazardous characteristic of toxicity for benzene (D018), it is conditionally exempt from the hazardous waste management requirements (6 NYCRR Parts 370-374 and 376) when destined for thermal treatment in accordance with the requirements set forth in NYSDEC's TAGM HWR-4061, *Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants* (NYSDEC, 2002a). If MGP-related hazardous wastes are destined for land disposal in New York, the state hazardous waste regulations apply, including LDRs and alternative LDR treatment standards for hazardous waste soil.

The LDR for hazardous waste soil is a 90 percent reduction in constituent concentration capped at 10 times the Universal Treatment Standards (10xUTS). This means that if concentrations of constituents in excavated soil exceed 10xUTS, the soil would need to be treated to reduce constituent concentrations to below 10xUTS prior to land disposal. Under the Phase IV, Part 2 regulations, characteristically hazardous MGP-impacted soil may be rendered non-hazardous after generation at the remediation site by conditioning the soil with clean materials to render the impacted soil amenable to treatment and to reduce concentrations of the chemical constituents in soil to less than the hazardous characteristic(s). Following mixing, the soil would no longer be considered a hazardous waste, but would still have to meet the LDR requirements.

The USDOT and New York State rules for the transport of hazardous materials are provided under 49 CFR Parts 107 and 171.1 through 172.558 and 6 NYCRR 372.3. These rules include procedures for packaging, labeling, manifesting, and transporting of hazardous materials and would potentially be applicable to the transport of hazardous materials under any remedial alternative. New York State requirements for waste transporter permits are included in 6 NYCRR Part 364, along with standards for the collection, transport, and delivery of regulated wastes within New York. Contractors transporting waste materials off site during the selected remedial alternative would need to be properly permitted.

Section 401 (State Water Quality Certification) of the Clean Water Act (CWA) is administered by the NYSDEC. Any remedial alternatives that result in a discharge into Otsquago Creek would need to comply with the substantive provisions of a State Water Quality Certification from the NYSDEC.

The National Pollutant Discharge Elimination System (NPDES) program also is administered in New York by the NYSDEC as a State Pollutant Discharge Elimination System (SPDES). If the selected remedial alternative for the site results in discharges to surface water (due to dewatering or other activities), discharge limits would need to be established for individual constituents in accordance with the NYSDEC SPDES (6 NYCRR 750-758). Additionally, underground injection control (UIC) notifications to the USEPA would be required if liquids were introduced into the groundwater as part of site remediation. For remediation projects where the NYSDEC provides oversight, the USEPA typically requires only a letter containing enough detail to understand the process and where the injection is taking place to provide an "authorization by rule".

A remedial alternative conducted within the site would need to comply with applicable requirements outlined under the Occupational Safety and Health Administration (OSHA). General industry standards are outlined under OSHA (29 CFR 1910) that specify time-weighted average concentrations for worker exposure to various compounds and training requirements for workers involved with hazardous waste operations. The types of safety equipment and procedures to be followed during site remediation are specified under 29 CFR 1926, and recordkeeping and reporting-related regulations are outlined under 29 CFR 1904. Trenching and excavation requirements are provided in 29 CFR 1926 (Parts 650 – 652).

In addition to the requirements outlined under OSHA, the preparedness and prevention procedures, contingency plan, and emergency procedures outlined under RCRA (40 CFR 264) are potentially relevant and appropriate to those remedial alternatives that include the generation, treatment, or storing of hazardous wastes.

2.2.3 Location-Specific SCGs

The potential location-specific SCGs for the site are summarized in Table 2-3. Examples of potential location-specific SCGs include regulations and federal acts concerning activities conducted in floodplains, wetlands, historical areas, and activities affecting navigable waters and endangered/threatened or rare species. Location-specific SCGs also include local requirements such as local building permit conditions for permanent or semi-permanent facilities constructed during the remedial activities (if any), and influent requirements of publicly owned treatment works (POTW) if water is treated within the site and discharged to these facilities.

As part of the PSA/IRM Study, the Fish and Wildlife Impact Analysis (FWIA) concluded no endangered species were identified at the site.

In addition, ARCADIS visited the National Register of Historic Places website (www.nr.nps.gov) and performed a location search for Fort Plain, New York. No records were present for historical sites in the immediate vicinity of the MGP site.

3. Development of Remedial Action Objectives

3.1 General

This section of the Feasibility Study presents the RAOs for the impacted media that have been identified within 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 COCs at the project area and to assist in developing quantitative goals for cleanup of the COCs in each medium that requires remediation.

The following subsections briefly summarize the results from the human health exposure assessment, and identify the RAOs for impacted media in the project area.

3.2 Human Health Exposure Assessment Summary

A qualitative human health exposure assessment (HHEA) was performed as part of the remedial investigation (Stearns & Wheler, 2004). The HHEA used information regarding current and foreseeable land use and available data to identify COCs and evaluate exposure of human receptors at the former MGP property and area located east of Hancock Street. The HHEA first identified COCs at the site, then evaluated potential routes of exposure to those COCs. Detections of COCs alone do not necessarily indicate unacceptable risks to human health; variables such as concentration, complete routes of exposure, and frequency and duration of exposure were also considered.

BTEX and PAHs were found to be the COCs for soil and groundwater at the site. COCs were identified on the former MGP property in surface soil, subsurface soil, and groundwater, and in off-site subsurface soil and groundwater.

The HHEA found that levels of site-related COCs in some soil and groundwater exceeded appropriate screening criteria. As such, potentially complete exposure pathways for site-related constituents were evaluated. The HHEA concluded that:

- There are no complete exposure pathways associated with surface soil.

- Under current use and daily operations, 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 ingestion, dermal contact and inhalation).

- 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. Human exposure to impacted groundwater is greatest during construction/ excavation activities (e.g., maintenance of underground utilities).

- The potential exposure of construction workers to impacted soil and groundwater would be mitigated by using properly trained personnel, engineering and administrative controls and appropriate personal protective equipment.

Future exposure could potentially occur during construction activities that expose workers to impacted soil and groundwater or in the unlikely event that a water supply well is installed in close proximity to the site.

The HHEA was presented in the revised *Remedial Investigation (RI) Report* (Stearns & Wheler, 2004) and subsequently approved by the NYSDEC in a letter dated July 9, 2004. Although additional investigations were completed at the site subsequent to NYSDEC approval of the *RI Report*, the subsequent investigations were conducted to better define the extent of impacts such that a thorough evaluation of remedial alternatives could be evaluated. These subsequent investigations did not change the conclusions presented in the HHEA.

3.3 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. Based on the results from the HHEA, along with the environmental sampling data and preliminary discussions with the NYSDEC during a feasibility scoping meeting conducted on March 13, 2007, RAOs were developed for the site.

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

- contact with, or inhalation of MGP-related COCs in soil or groundwater

- ingestion of MGP-related COCs in soil
- the source of MGP-related groundwater impacts
- migration of MGP-related COCs that would result in groundwater impacts

In addition, the RAOs for the site include improving groundwater quality where impacted by MGP operations, achieving groundwater standards to the extent practicable.

3.3.1 Surface Soil

Based on the results presented in the HHEA, the lack of complete exposure pathways, and continued use of the former MGP property as a utility substation for the foreseeable future, RAOs specific to surface soil are not required. National Grid will, however; maintain the existing surface cover material and fencing that currently exists at the former MGP property to continue to protect against potential human exposure to surface soil.

3.3.2 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 construction/excavation activities (including utility work).

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 accomplished by remediation of the source area, to the extent practicable.

3.3.3 Groundwater

Even though it is not used as a drinking water source, the groundwater beneath the site is classified as Class GA and, as such, the Class GA groundwater standards and guidance values are applicable. The extent of groundwater containing BTEX and PAHs is presented in Section 1.5.

Groundwater at the site is not used for drinking; therefore, the greatest potential for exposure is via direct contact that may occur during construction/excavation work. The potential for direct contact during construction/excavation work is primarily for work being conducted on the former MGP property, as groundwater is located at depths of 16 to 18 feet bgs to the north and east of the property. This potential exposure could be mitigated by using properly-trained personnel and personal protective equipment.

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 restoring the quality of groundwater to current standards, to the extent practicable.

4. Technology Screening Summary and Development of Remedial Alternatives

4.1 Introduction

This section of the Feasibility Study Report identifies remedial alternatives to achieve the RAOs described in Section 3.3. As an initial step, general response actions (GRAs) are identified to address subsurface soil and groundwater impacted by MGP-related COCs. GRAs are medium-specific and describe actions that will satisfy the RAOs, and may include various actions such as treatment, containment, institutional controls, excavation, or any combination of such actions. From the GRAs, potential remedial technology types and process options were identified and screened to determine those that were the most appropriate for the site. Technologies/process options that were retained following the screening were used to develop remedial alternatives. Detailed evaluations of these remedial alternatives are presented in Section 5.

According to the USEPA's "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA"* (USEPA, 1988a), the term "technology type" refers to general categories of technologies. The term "technology process options" refers to specific processes within each technology type. For each GRA identified, a series of technology types and associated process options has been assembled. In accordance with the USEPA's guidance document, each technology type and associated processes are briefly described and evaluated against preliminary and secondary screening criteria. This approach was used to determine if the application of a particular technology type or process option is applicable given the site-specific conditions for remediation of the impacted media. Based on this screening, remedial technology types and process options were eliminated or retained and subsequently combined into potential remedial alternatives for further, more detailed evaluation. This approach is consistent with the screening and selection process provided in the NYSDEC's TAGM 4030, *Selection of Remedial Actions at Inactive Hazardous Waste Sites* (NYSDEC, 1990).

The NYSDEC Division of Environmental Remediation's (DER's) *Presumptive/Proven Remedial Technologies* (DER-15) allows for use of the industry's experience related to remedial cleanups to focus the evaluation of technologies to those that have been proven to be both feasible and cost-effective for specific site types/or contaminants. The objective of DER-15 is to use experience gained at remediation sites and scientific and engineering evaluation of performance data to make remedy selection quicker and consistent. In addition, known future use of the former MGP property as an electrical substation was considered during the screening process.

4.2 General Response Actions

Based on the RAOs identified in Section 3.3, the following site-specific GRAs were established for subsurface soil and groundwater at the site:

- No Further Action
- Institutional Controls
- In-Situ Containment/Controls
- In-Situ Treatment
- Removal
- Ex-Situ On-Site Treatment
- Off-site Treatment and/or Disposal

Within each of these GRAs, remedial technology types were identified for each impacted medium as described below. A No Further Action GRA has been included and retained throughout the screening evaluation as required by USEPA and NCP guidance.

4.3 Identification of Remedial Technologies

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).

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

- *Remediation Technologies Screening Matrix and Reference Guide* (USEPA and USAF, 1993).

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

Although each former MGP site is unique, the evaluation of remedial technology types and process options that are applicable to MGP-related impacts, capable of achieving the RAOs identified for the Fort Plain site, or have been implemented at other MGP sites, is well documented. Therefore, this collective knowledge and experience, and regulatory acceptance of previous feasibility studies performed on MGP-related sites with similar impacts, were used to narrow the potentially applicable process options for the Fort Plain former MGP site to those with documented success with achieving similar RAOs.

The GRAs and technology types are included in Table 4-1 for subsurface soil and Table 4-2 for groundwater.

4.4 Remedial Technology Screening

The potentially applicable remedial technology types and technology process options associated with each of the GRAs underwent preliminary and secondary screening to select the technologies that could effectively achieve the RAOs identified for the site.

For this Feasibility Study Report, specific off-site treatment or disposal options for groundwater or subsurface soil were not evaluated. This was purposely done to allow for an evaluation of costs for off-site disposal/treatment facilities at the time if that remedial alternative is implemented. A better understanding related to disposal/treatment facility availability, cost fluctuations based on season, market conditions, and facility capacity would exist at that time. For alternative evaluation purposes; however, an estimated unit cost for off-site low-temperature thermal desorption (LTTD) of materials was used as a representative technology for each of the alternatives, where appropriate. Additional off-site disposal options are presented with brief descriptions in the screening tables; however, all were retained for further consideration during the engineering design phase of the remediation.

The following subsections summarize the preliminary and secondary screening evaluations.

4.4.1 Preliminary Screening

Preliminary screening was performed to focus the number of potentially applicable technology types on the basis of technical implementability and effectiveness (long- and short-term). Technical implementability was evaluated using site characterization information collected during the remedial investigations, including the types and concentrations of impacts and subsurface conditions, to screen out technology types and process options that could not effectively be implemented at the site. The effectiveness of a technology is measured by its ability to meet the established RAOs.

4.4.1.1 Surface Soil

As presented in Sections 3.2 and 3.3.1, complete exposure pathways do not exist for human exposure to surface soil. RAOs, therefore, were developed to reflect exposures to subsurface soil containing MGP-related COCs. Maintaining the existing surface cover material at the former MGP property would achieve these RAOs. Therefore, maintaining the existing surface cover will be retained throughout the screening process, and included in each active remediation alternative that is developed. Screening of additional technology types and process options for surface soil is therefore not necessary.

4.4.1.2 Subsurface Soil

As presented in Table 4-1, the following remedial technologies were identified to address the GRAs identified for subsurface soil:

- No Further Action – No active remedial activities would be implemented to address the subsurface soil containing MGP impacts above the RAOs.

- Institutional Controls – Remedial technologies associated with this GRA consist of non-intrusive administrative controls focused on minimizing contact with MGP impacts.

- In-Situ Containment/Controls – Remedial technology types associated with this GRA involve addressing the mobility and/or exposure to impacted subsurface soil without removing or otherwise treating them. Remedial technology types evaluated under the preliminary screening process consisted of surface control, capping and containment.

- In-Situ Treatment – Remedial technology types associated with this GRA involve treating the MGP-related impacts to subsurface soil, without removing the soil, to achieve the established RAOs. Remedial technology types evaluated for the site included immobilization, steam injection/extraction (i.e., steam injection to mobilize COCs followed by extraction), chemical treatment and biological treatment.

- Removal – Remedial technology types associated with this GRA involve removal of subsurface soil containing MGP-related impacts from the ground to achieve the established RAOs. Excavation was the technology type evaluated for this GRA.

- Ex-Situ On-Site Treatment – Remedial technology types associated with this GRA consider the treatment of materials after they have been removed from the ground. Ex-situ on-site remedial treatment technology types evaluated under the preliminary screening evaluation consist of immobilization, extraction (thermal desorption) and thermal destruction.

- Off-site Treatment and/or Disposal – Remedial technology types associated with this GRA consider the off-site treatment of subsurface soil containing MGP-related impacts after it has been removed from the ground. As stated above, the specific method of off-site treatment or disposal technology type was not identified or evaluated. However, a list of potentially acceptable treatment or disposal technologies is included in Table 4-1. These remedial treatment technologies consisted of recycle/reuse, extraction (thermal desorption) and disposal.

4.4.1.3 Groundwater

As presented in Table 4-2, the following remedial technologies were identified to address the GRAs identified for groundwater:

- No Further Action – No active remedial activities would be implemented to address groundwater that contains MGP-related COCs.

- Institutional Controls – Remedial technology types associated with this GRA generally consist of non-intrusive administrative controls focused on minimizing contact or use of the groundwater. Institutional controls evaluated under the preliminary screening consisted of groundwater use restrictions in the form of governmental and/or proprietary controls, enforcement and/or permit controls.

- In-Situ Containment/Controls – Remedial technology types associated with this GRA involve addressing the COC-impacted groundwater without removing or otherwise treating the groundwater. Remedial technology types evaluated under the preliminary screening process consisted of hydraulic control and physical containment.

- In-Situ Treatment – Remedial technology types associated with this GRA involve addressing the COC-impacted groundwater without extracting the groundwater. These remedial technology types would remove or otherwise alter the MGP residuals in groundwater to achieve the RAOs for the site. Remedial technology types evaluated included biological treatment, chemical treatment and extraction (i.e., in-situ stripping).

- Removal – Remedial technology types associated with this GRA consider removal of NAPL and/or COC-impacted groundwater for treatment and/or disposal. The technology type evaluated under the preliminary screening process was groundwater and/or NAPL extraction.

- Ex-Situ On-Site Treatment – Remedial technology types associated with this GRA consider the treatment of COC-impacted groundwater after the groundwater has been removed. Ex-situ on-site remedial treatment technologies evaluated to address the extracted groundwater under the preliminary screening evaluation consisted of chemical treatment and physical treatment.

- Off-Site Treatment and/or Disposal – Remedial technology types associated with this GRA consider the off-site disposal of site groundwater that has been removed. Disposal technology process options evaluated to address COC-impacted groundwater consisted of discharge to a POTW, and discharge to a commercially operated treatment facility.

4.4.2 Secondary Screening

To further reduce the potentially applicable technologies, process options for subsurface soil and groundwater were subjected to a secondary screening. The objective of the secondary screening was to identify, when possible, one process option to represent each technology type to simplify the subsequent development and evaluation of the remedial alternatives. The secondary screening criteria are described below:

- Effectiveness – This criterion is used to evaluate each technology process option with respect to other process options within the same technology type. This evaluation focused on the process option's:

  – effectiveness at meeting the RAOs by reducing the toxicity, mobility and/or volume of chemical constituents in the impacted medium

- impacts to human health and the environment during the construction and implementation phase
- reliability with respect to the nature and extent of impacts and conditions at the site

- Implementability – Implementability encompasses both the technical and administrative feasibility of implementing a process option. Because technical implementability was used during the preliminary screening, this subsequent, more detailed evaluation places more emphasis on the institutional aspects of implementability (e.g., the ability to obtain necessary permits for off-site actions, the availability of treatment, storage, and disposal services, etc.). This criterion also evaluates the ability to construct the process option, and availability of specific equipment and technical specialists to design, implement and operate and maintain the equipment.

- Relative Cost – This criterion evaluates the overall cost required to implement the remedial technology. As a screening tool, relative capital and operation and maintenance (O&M) costs are used rather than detailed cost estimates. For each technology process option, relative costs are presented as low, moderate or high, and made on the basis of engineering judgment and industry experience.

Per the USEPA guidance (USEPA, 1988), the secondary screening focuses on the effectiveness criterion, with less emphasis placed on the implementability and cost evaluation criteria.

The results of the secondary screening of technology types and process options are also presented in Tables 4-1 and 4-2 for subsurface soil and groundwater, respectively. The technology processes that were not retained have been shaded in the tables.

As shown on Tables 4-1 and 4-2, all ex-situ on-site treatment technologies were eliminated from further consideration. These technologies were eliminated based on the following considerations:

- current and future uses of the former MGP property as an electrical substation

- space limitations within the former MGP property for treatment system construction, operation, and soil/groundwater handling

- the property east of Hancock Street is not owned by National Grid; therefore long-term access considerations and space limitations exist for placement of a treatment system equipment
- long-term operation and maintenance time requirements associated with on-site treatment technologies
- potential exposure to/public acceptance of a long-term on-site treatment system
- presence of overhead obstructions
- relatively high costs

Based on the results of the secondary screening, the remedial technology types and process options that were retained for further evaluation are presented below.

4.4.2.1 Subsurface Soil

This section describes the basis of selection for each representative subsurface soil and groundwater remedial technology type and process option that was retained for further evaluation.

No Further Action – Consistent with NCP and USEPA guidance for conducting feasibility studies, the No Further Action alternative must be developed and examined as a baseline to which other remedial alternatives are compared. Although this technology does not include active remedial actions, it will be retained for further consideration. Through time, natural attenuation processes would reduce the toxicity, mobility and volume of impacts to the environment. However, monitoring of site conditions would not be conducted to document the natural attenuation processes. It is not anticipated that this technology would receive regulatory approval.

Institutional Controls – 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 or ingestion of, MGP-related COCs. Additionally, institutional controls could enhance the effectiveness and implementability of other technologies/process options and thus was retained for further consideration.

In-Situ Containment/Controls – Surface control was retained for further consideration. The existing cover materials on the former MGP property would be maintained to provide continued protection against exposure to subsurface soil containing COCs.

Capping and containment were also identified as potentially suitable remedial technology types for in-situ containment/controls. The capping options evaluated during the secondary screening included clay/soil, asphalt and multimedia caps. All capping options are easily implemented, and their relative costs are comparable (moderate to high). However, no capping options were retained for further evaluation because capping would not reduce toxicity or volume of impacts or prevent further migration of MGP-related COCs to a greater extent than the surface control option. In addition, given the use of the former MGP property for the foreseeable future, maintaining the existing cover materials is considered as protective, and more cost effective, than each of the capping technology types.

Containment options included sheetpile and slurry walls. Neither sheetpile nor slurry walls were retained for further evaluation as a stand-alone technology. While both process options would contain, and therefore reduce the migration (i.e., mobility) of COCs, neither would effectively treat nor remove MGP impacts. The space limitations, site topography, size of the former MGP site, presence of overhead electrical lines and underground obstructions and utilities make these options difficult to implement. In addition, these process options would not be effective in meeting the established RAOs unless they were implemented in conjunction with other remedial technologies. Sheetpile has been retained for use as a potential technology to support other process options (e.g., excavation support).

In-Situ Treatment – The in-situ remedial treatment technologies identified for subsurface soil include immobilization, steam injection/extraction (steam injection to mobilize COCs followed by extraction), chemical treatment and biological treatment.

Solidification/stabilization is considered effective for immobilizing COCs; however, limited data exists to confirm its ability to immobilize NAPL over time. The technology is potentially implementable with moderate capital and O&M costs, pending confirmation via bench-scale testing. The presence of underground structures, obstructions, and fill material containing debris could also affect the implementability and effectiveness of solidification/stabilization. Removal of subsurface structures would be required (e.g., northern gasholder); however, removal of the northern gas holder would remove a significant portion of the MGP-impacted material, therefore reducing the efficiency and cost-effectiveness of in-situ stabilization. In addition, lack of space to implement this technology, the presence of the electrical substation, and steep hill limit the effectiveness of this technology. Given these potential unknowns and site constraints, solidification/stabilization was not retained for further evaluation.

The steam injection/extraction option, Dynamic Underground Stripping and Hydrous Pyrolysis/Oxidation (DUS/HPO) was not retained due to concerns regarding potential mobilization of NAPL, reliability of vapor recovery, available space for treatment equipment, the presence and proximity of underground utilities, and potential public acceptance issues.

The chemical treatment option considered was chemical oxidation. A field treatability study was attempted on the former MGP site in 2004; however, site constraints, including limited space, underground obstructions, site topography and overhead utilities precluded the completion of the test. A bench-scale treatability study would be required to estimate oxidant demand; anticipated high oxidant demand would limit the cost-effectiveness of this option. Multiple treatments with highly reactive oxidants would be required. In addition, there is limited space available on site for process chemical storage. Therefore, this option was not retained for further evaluation.

Biological treatment options include biodegradation, enhanced biodegradation, and biosparging. These options are not effective for reducing concentrations of heavily MGP-impacted material, and heavier, more condensed PAHs adsorbed to subsurface soil. An extended period of time would be required to achieve the RAOs. Therefore, the biological treatment options for subsurface soil were not retained for further consideration.

<u>Removal</u> – Excavation of subsurface soil was retained for further evaluation. This technology type and process option is a proven process for removing impacted material. Excavation of soil is considered implementable; however, site-specific constraints (e.g., overhead obstructions, underground utilities, limited size of the former MGP property, topography, and logistics of site, etc.) could limit the extent to which excavation could be implemented. Equipment and labor capable of soil excavation is readily available, and while it has a high capital cost, O&M costs are considered low.

<u>Off-Site Treatment and/or Disposal</u> – Remedial technology types and process options retained for evaluation consisted of recycle/reuse (asphalt concrete batch plant, brick/concrete manufacture, and co-burn in a utility boiler), extraction (low-temperature thermal destruction [LTTD]), and off-site disposal (non-hazardous solid waste landfill or RCRA landfill). Each of these technologies was retained due to the ease of implementability

and effectiveness of the technologies. As stated above, these process options were included in the screening tables for consideration; however, the ultimate off-site treatment or disposal of materials that may be removed from the site was not evaluated at this time. In addition, multiple off-site treatment technologies could be utilized to treat or dispose of media with different concentrations of impacts.

4.4.2.2 Groundwater

<u>No Further Action</u> – Consistent with the requirements of the NCP, the No Further Action alternative was retained as a remedial technology during the secondary screening step. Although this technology does not include any active remedial activity, it typically includes some form of institutional controls. No Further Action was retained and used as a baseline against which other remedial options were compared.

<u>Institutional Controls</u> – Institutional controls for groundwater use restrictions (in the form of governmental, proprietary, enforcement or permit controls and/or informational devices [e.g., signs, postings, etc.] and notification requirements) were retained for further evaluation. Because institutional controls would not treat, contain or remove any COCs in site groundwater, institutional controls alone would not achieve the RAOs established for the site. However, institutional controls may partly achieve the RAO of reducing, to the extent practicable, potential human exposure to groundwater containing COCs. Institutional controls could enhance the effectiveness or implementability of other technologies/technology process options.

<u>In-Situ Treatment</u> – The in-situ remedial treatment technologies considered for groundwater consisted of biological treatment (monitored natural attenuation [MNA], enhanced MNA, and biosparging), chemical treatment (chemical oxidation), and in-situ striping/extraction (DUS/HPO). The biological treatment process options were retained due to the ease of implementation and low to moderate relative costs, although some options may require treatability studies to verify reliability and effectiveness as well as the length of time necessary to achieve the RAOs. Chemical oxidation was not retained for further evaluation as access to areas that would require oxidant injection are limited by site size, presence of overhead obstacles and underground obstructions (including utilities and the former Erie Canal structure). As previously stated, a field treatability study was attempted on the former MGP site in 2004; however, site constraints precluded the completion of the test. A bench-scale treatability study would be required to estimate oxidant demand. The in-situ stripping/extraction option, DUS/HPO was not retained due to concerns regarding mobilization and recovery of dissolved COCs, reliability of vapor recovery, available space for treatment equipment, and potential public acceptance issues.

In-Situ Containment/Controls – The in-situ containment/control remedial treatment technologies considered for groundwater consisted of hydraulic control (groundwater extraction using recovery wells) and slurry walls. Neither option was retained due to site-specific issues and considerations associated with effectiveness and implementability (e.g., subsurface obstructions and underground utilities), long-term operation and maintenance requirements, and high relative costs.

Removal – For this technology type, four technology process options were evaluated for groundwater and/or NAPL extraction, including vertical wells, horizontal wells, collection trenches and passive NAPL removal. In general, inefficiencies associated with pump and treat technologies exist, including the requirement to pump and treat large volumes of water, lack of long-term access to areas that may require wells (i.e., implementability concerns), and the limited space to construct and operate for pumping and treatment equipment.

Active site-wide removal of groundwater was not retained for further evaluation as a stand-alone process option; however, pumping and treating of water was retained as a process option as it may enhance the effectiveness of other technologies (e.g., dewatering during excavation). NAPL has not accumulated in any well located at the site, and it therefore, is not considered to be mobile. However, passive NAPL removal is retained in the event that mobile NAPL is detected in an existing well in the future.

Off-Site Treatment and/or Disposal – Technology process options evaluated for groundwater disposal consisted of discharge to a POTW and discharge to a commercially operated treatment facility. These technology process options were retained and would be used as part of a treatment regimen for extracted groundwater during dewatering activities.

4.5 Summary of Retained Remedial Technologies

The following table summarizes the remedial technology types and process options that were retained through secondary screening:

Medium	Technology Type	Process Options
Subsurface Soil	No Further Action	No Further Action
	Institutional Controls	Governmental Controls, Proprietary Controls, Enforcement and Permit Controls, and Informational Devices (signs, postings, etc.)
	In Situ Containment/Controls	Surface Controls and Sheet Piles (retained to support other technologies- not as a

Medium	Technology Type	Process Options
		stand-alone technology)
	Excavation	Excavation
	Off-site Treatment and/or Disposal (Recycle/Reuse, Extraction, and Disposal)	Asphalt Concrete Batch Plant, Brick/Concrete Manufacture, Co-Burn in Utility Boiler, Extraction (LTTD), Solid Waste Landfill, and, RCRA Landfill
Groundwater	No Further Action	No Further Action
	Institutional Controls	Governmental Controls, Proprietary Controls, Enforcement and Permit Controls, and Informational Devices (signs, postings, etc.)
	In-Situ Biological Treatment	MNA, Enhanced MNA, and Biosparging
	Removal	Passive NAPL Removal
	Off-Site Treatment and/or Disposal	Discharge to POTW and/or POTF

As stated in Section 4.4, off-site treatment/disposal of soil would be determined by National Grid during the remedial design.

4.6 Development of Remedial Alternatives

This section uses the screened technologies presented in the above table to develop remedial alternatives capable of addressing the RAOs for the site. The assembled subsurface soil and the groundwater remedial alternatives are summarized in Sections 4.6.1 and 4.6.2, respectively.

As presented in Section 1.5.2, and shown on Figure 1-4, a relatively thin layer of MGP-impacted material was identified beneath the existing restaurant parking lot located east of Hancock Street. This heavily impacted material was detected immediately above the silt and clay confining layer located from approximately 15 to 21 feet bgs. The silt and clay confining layer and heavily impacted material exists below an additional silt and clay fill layer observed at approximately 10 feet bgs that is suspected to be the sub-base of the former Erie Canal.

Based on the depth of the MGP-impacted material located east of Hancock Street, its location beneath the base of the former Erie Canal, no existing exposure scenarios based on current or anticipated future site use, and the presence of overhead and underground utilities, removal and/or treatment of MGP-impacted material east of Hancock Street is not warranted. In addition, activities associated with removal and/or treatment of this material would severely impact current operations of the restaurant. However, to evaluate a complete range of alternatives, removal and/or treatment of MGP-impacted material located east of Hancock Street is included as part of Alternative SM4.

Similarly, MGP-impacted material exists from 5 to 8 feet bgs within the southern gas holder located on the former MGP property. A utility pole containing a transformer that is part of the electrical substation was installed within the footprint of this gas holder. An additional utility pole also containing a transformer associated with the substation exists immediately adjacent to the southern gas holder. Removal and/or treatment of the MGP-impacted material within the southern gas holder is not included as part of alternatives SM2 through SM4 developed for the site because:

- No impacts to soil or groundwater above regulatory criteria exist in the immediate vicinity of the southern gas holder; therefore, no impacts to the environment are occurring.

- The depth to impacts begins at 4 feet bgs; therefore, no exposure scenarios exist under current property uses.

- Removal could not be completed without relocation of the electrical substation. Interruption of the electrical service to the Village of Fort Plain, and/or relocation of the electrical substation is not considered feasible.

4.6.1 Subsurface Soil Remedial Alternatives

Five remedial alternatives, labeled SM1 through SM5, have been identified to address the RAOs for subsurface soil at the site. In keeping with NCP and USEPA requirements, Alternative SM1, No Further Action, is provided in the detailed evaluation as a basis for comparison for the other alternatives. In the process of developing the remedial alternatives, a broad range of removal-based alternatives were considered. Four additional alternatives consist of excavation of subsurface soil based on increasing limits of excavation, as follows:

- Alternative SM2 includes removal of the contents of the northern gas holder and removal of MGP-impacted material from the former MGP property above the top of groundwater, to the extent practicable.

- Alternative SM3 includes removal of the northern gas holder and its contents, and removal of MGP-impacted material from the former MGP property above the silt and clay confining layer, to the extent practicable.

- Alternative SM4 includes removal of the northern gas holder and its contents, and removal of soil containing MGP-related constituents with concentrations greater than 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for commercial use, to the extent practicable.

- Alternative SM5 includes removal of soil from the former MGP property that exceeds 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives. As required by 6NYCRR Part 375 Subpart 2.8(c)(2)(i) Alternative SM5 is included as part of this Feasibility Study Report; however, this alternative is not technically feasible due to the presence of the electrical substation and associated electric utilities, and the presence of the steep hillside located on the western side of the property. Based on implementability and technical feasibility concerns, and the impracticability of relocating the electrical substation, providing temporary electrical service to the Village of Fort Plain, and evaluating permit/siting requirements, the NYSDEC concurred that this Alternative SM5 is not feasible and that a detailed evaluation of this alternative would not be required. However, to satisfy the requirements of 6NYCRR Part 375, a description of Alternative SM5 has been provided below. Although not retained for detailed evaluation, a cost for Alternative SM5 is included in Section 5 for comparison purposes.

Brief descriptions of the potential remedial alternatives for subsurface soils are presented below; detailed descriptions are presented in Section 5.

4.6.1.1 Alternative SM1 – No Further Action

Under this alternative, no active remedial activities would be conducted; however, implementation of institutional controls in the form of governmental, proprietary, enforcement, or permit controls and/or informational devices (e.g., signs, postings, etc.) would be included to limit excavation and groundwater usage. The No Further Action alternative is readily implementable. However, since this alternative does not meet the RAOs for subsurface soil, it is not anticipated that this alternative would be selected as the preferred, or “stand alone” remedial approach. As stated previously, pursuant to NCP and USEPA guidance, the No Further Action alternative must be developed and examined as a baseline by which other remedial alternatives are compared.

4.6.1.2 Alternative SM2 – Remove Contents of Northern Gas Holder

This alternative would involve the excavation and off-site disposal of the contents of the northern gas holder as well as excavation and off-site disposal of MGP-impacted material on the former MGP property above the groundwater table, to the extent practicable. It is anticipated that installation of temporary sheet pile walls would be required during excavation to stabilize the steep hillside. Following removal/excavation, the excavated area would be backfilled with select fill. Following compaction and grading of the fill material, approximately 6 inches of crushed stone, or similar (to be consistent with existing cover material), would be placed over the top of the fill. Site restoration would include installation of fencing to mitigate unauthorized access. In addition, institutional controls in the form of governmental, proprietary, enforcement, or permit controls, and/or informational devices (e.g., signs, postings, etc.) would be instituted to limit future excavation. In addition, a monitoring/recovery well would be installed within the southern gas holder. The well would be periodically gauged for the presence of NAPL. Accumulated NAPL would be removed.

4.6.1.3 Alternative SM3 – Remove Northern Gas Holder and MGP-Impacted Material Above Confining Layer on Former MGP Property

This alternative involves removal of the northern gasholder structure and its contents, and excavation of heavily MGP-impacted material above the silt and clay confining layer (located at approximately 13 to 15 feet bgs) on the former MGP property (located adjacent to the northern gasholder), to the extent practicable. Installation of temporary sheet pile walls would be required for excavation sidewall stability and dewatering purposes. Water generated during dewatering activities would be treated on-site and either disposed at a POTW or transported off site for disposal. Excavated areas would be backfilled with select fill. The select fill would be compacted and graded, and 6 inches of crushed stone, or similar (to be consistent with the existing cover materials), would be placed over the top of the fill. An oxygen-releasing compound and/or other suitable treatment amendments (e.g., nutrients) will be added to the backfill material that is used below the groundwater table to stimulate growth of indigenous bacteria and enhance the degradation of dissolved MGP residuals. Site restoration would include fencing to minimize unauthorized access. Institutional controls in the form of governmental, proprietary, enforcement, or permit controls, and/or informational devices (e.g., signs, postings, etc.) would be instituted to limit future excavation. Similar to Alternative SM2, a monitoring/recovery well would be installed within the southern gas holder. The well would be periodically gauged for the presence of NAPL, and if present, removed.

4.6.1.4 Alternative SM4 – Remove Northern Gas Holder and Soil Above 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use

Under this alternative, the northern gas holder and its contents would be removed and treated/disposed off site. In addition, where practicable, soil on the former MGP property and east of Hancock Street located above the silt and clay confining layer containing COCs at concentrations exceeding their respective 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for commercial use would be excavated and treated/disposed off site. Installation of temporary sheet pile walls would be required for excavation sidewall stability and for dewatering purposes. Water generated during dewatering activities would be treated on-site and either disposed at a POTW or transported off site for disposal. Excavated areas would be backfilled with select fill. An oxygen-releasing compound and/or other suitable treatment amendments (e.g., nutrients) will be added to the backfill material that is used below the groundwater table to stimulate growth of indigenous bacteria and enhance the degradation of dissolved MGP residuals. The select fill would be compacted and graded, and the excavation areas would be restored to pre-construction conditions (approximately 6 inches of crushed stone on the former MGP property and asphalt on the properties located east of Hancock Street). MGP-impacted material and COCs above 6 NYCRR Part 375 commercial criteria would remain at locations that could not be reasonably accessed (e.g., beneath Hancock Street, beneath underground utilities adjacent to Hancock Street and State Street, beneath/adjacent to the electrical substation, beneath overhead transportation and distribution electrical lines originating from the electrical substation, and within the southern gas holder); therefore, institutional controls would be required to limit future excavation and use of groundwater. In addition, a monitoring/recovery well would be installed within the southern gas holder. The well would be periodically gauged for the presence of NAPL, and if present, removed.

4.6.1.5 Alternative SM5 – Remove Northern and Southern Gas Holders and Soil Exceeding 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives from the Former MGP Property

Under this alternative, the northern and southern gas holders and their contents would be removed and treated/disposed off site. In addition, soil on the former MGP property located above the silt and clay confining layer containing constituents at concentrations exceeding their respective 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives would be excavated and treated/disposed off-site. A feasibility analysis evaluating the potential siting of a new electrical substation (including property procurement, permitting and regulatory requirements, etc.), and providing temporary electrical supply to the Village of Fort Plain would be conducted. The electrical substation would be dismantled prior to removal of

MGP-impacted soil. Installation of a containment technology (e.g., temporary sheet pile walls) would be required for excavation sidewall stability and for dewatering purposes. Water generated during dewatering activities would be treated on-site and either disposed at a POTW or transported off-site for disposal. Excavated areas would be backfilled with select fill, compacted and restored to grade. Institutional controls would not be required to limit future use of the site or groundwater. Due to site logistics, this alternative would require several years to implement. As stated above, this alternative is not technically feasible and will not require detailed evaluation in Section 5.

4.6.2 Groundwater Remedial Alternatives

Three remedial alternatives have been developed for addressing impacted groundwater at the Fort Plain site and are presented below.

4.6.2.1 Alternative GW1 – No Further Action

Under this alternative, no active remedial activities would be conducted. However, this alternative would include the implementation of institutional controls in the form of governmental, proprietary, enforcement, or permit controls to limit the use of groundwater.

4.6.2.2 Alternative GW2 – Monitored Natural Attenuation

Under this alternative, groundwater monitoring would be conducted to document naturally-occurring chemical, biological, and/or physical processes that affect the toxicity, mobility, concentration, mass, or volume of the MGP constituent dissolved in groundwater. As presented above, the well installed within the southern gas holder would be gauged periodically for the presence of NAPL. Accumulated NAPL would be removed. In addition, this alternative would include implementation of institutional controls in the form of governmental, enforcement, or permit controls to limit the use of groundwater containing MGP-related constituents above NYSDEC Class GA standards and guidance values.

4.6.2.3 Alternative GW3 – Enhanced Monitored Natural Attenuation

This alternative includes the application of an oxygen-releasing compound and/or other amendments (e.g., nutrients) to the groundwater via vertical wells to stimulate growth of indigenous bacteria and enhance the degradation of dissolved MGP residuals. Application wells would be installed on the former MGP property and east of Hancock Street in the restaurant parking area. If combined with a soil removal alternative, groundwater conditions would be monitored for a period of five years after the soil has been removed to determine post-removal groundwater conditions prior to the design and installation of the application wells. As presented above, the well installed within the southern gas holder would be gauged periodically for the presence of NAPL, and if present, removed. In addition, this alternative would include implementation of institutional controls in the form of governmental, enforcement, or permit controls to limit the use of groundwater containing MGP-related constituents above NYSDEC Class GA standards and guidance.

5. Detailed Evaluation of Remedial Alternatives

5.1 General

This section presents the detailed evaluation of the remedial alternatives developed in Section 4. These remedial alternatives were evaluated with respect to the NCP criteria specified in 40 CFR Part 300 and the USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988). The purpose of the detailed analysis is to present adequate information for each alternative to allow selection of an appropriate remedy based on the evaluation criteria. These criteria encompass statutory requirements and include other measures such as overall feasibility and acceptability of remedial options.

To adequately address these requirements, nine evaluation criteria were developed and defined in the USEPA RI/FS guidance document. NYSDEC has adopted seven of these criteria which are defined in its guidance document NYSDEC TAGM 4030. These seven criteria include:

- 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

According to 40 CFR Part 300, another criterion to be considered when evaluating potential remedial alternatives is community acceptance. The NYSDEC will prepare a *Proposed Remedial Action Plan* (PRAP) based on it review of this Feasibility Study Report. The community acceptance assessment will be completed by the NYSDEC following the community's comments on the PRAP. Community comments will be considered by NYSDEC when assessing the recommended remedial alternatives.

5.2 Description of Evaluation Criteria

A brief description of each of the seven evaluation criteria is presented in the following sections.

5.2.1 Short-Term Effectiveness

The short-term effectiveness of a remedial alternative is evaluated relative to its potential effect on human health and the environment during the construction and implementation phases. The evaluation of each alternative with respect to its short-term effectiveness considered the following:

- potential short-term impacts to the community during implementation
- potential short-term impacts to workers during implementation and the effectiveness and reliability of protective measures
- potential short-term environmental impacts and the effectiveness of mitigation measures to be used
- time required to achieve the RAOs for protection of health and the environment

Specific considerations that should be evaluated for a remedial alternative relative to its short-term effectiveness are also identified in the USEPA's guidance (USEPA, 1988). The additional specific considerations that were pertinent to the site and therefore considered during the evaluation included addressing potential risks to the community.

In addition, an evaluation of the relative contributions of greenhouse gas emissions (i.e., Carbon Footprint) is provided for each subsurface alternative, as appropriate. The carbon footprint of each alternative is compared relative to the other alternatives to understand the relative contribution to greenhouse gas emissions. The relative carbon footprint estimation considers sources such as on-site combustion of fuels, off-site combustion of fuels (e.g., gas emissions associated with LTTD), and combustion of fuels associated with transportation.

5.2.2 Long-Term Effectiveness

This criterion addresses the results of the remedial action in terms of the risk remaining at the site after the remedial activities have been completed. The following factors were assessed during the evaluation of long-term effectiveness:

- environmental impacts from untreated waste or treatment residuals remaining at the completion of the remedial alternative

- the adequacy and reliability of controls (if any) that would be used to manage treatment residuals or remaining untreated waste

- the risks remaining after the response objectives have been met

- the alternative's ability to meet RAOs established for the medium

Specific considerations to be evaluated for a remedial alternative relative to its long-term effectiveness are identified in the USEPA's guidance (USEPA, 1988). The additional specific considerations that may be pertinent to the site as well as certain alternatives and therefore considered during the evaluation included:

- type and degree of long-term management and/or O&M requirements

- degree of confidence that controls can adequately handle potential problems

5.2.3 Reduction of Toxicity, Mobility, or Volume

This evaluation criterion addresses the degree to which the remedial alternative would permanently reduce the toxicity, mobility, or volume of the impacts present in the site media. This criterion addresses the preference for remedial actions that permanently and significantly reduce the toxicity of impacts, irreversibly reduce the mobility of the impacts, and/or reduce the total volume of media containing impacts. The evaluation focused on the following factors:

- the process the remedy would employ and the amount of materials that would be treated

- the remedy's anticipated ability to reduce the toxicity, mobility, or volume of impacts present in site media

- the nature and quantity of residuals that would remain after treatment

- the relative amount of MGP-related residuals that would be destroyed, treated, or recycled

- the degree to which the treatment is irreversible

Specific considerations that should be evaluated for a remedial alternative relative to its ability to reduce the toxicity, mobility, or volume of impacts are identified in the USEPA's guidance (USEPA, 1988). The additional specific considerations that were considered during the evaluation included:

- the remedy's ability to address the principal threats at the site, if any

- special requirements associated with the remedy

- risks that treatment residuals pose

5.2.4 Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing the remedial alternative, including the availability of the various services and materials required. The following analysis factors were considered during the implementability evaluation:

- *Technical Feasibility* – This refers to the relative ease of implementing or completing the remedial alternative based on site-specific constraints. In addition, the remedial alternative's constructability and operational reliability are considered, as well reliability of the technology and the ability to monitor the effectiveness of the remedial alternative.

- *Administrative Feasibility* – This refers to items such as coordination with other agencies and availability of services and materials, such as treatment, storage and disposal services, as well as required technical specialists and contractor services.

Specific considerations that should be evaluated for a remedial alternative relative to its implementability are identified in the USEPA's guidance (USEPA, 1988). The additional specific considerations that were considered during the evaluation included:

- difficulties and uncertainties associated with construction

- acquisition of permits for off-site activities, if required
- availability and demonstrated success of technology under consideration

5.2.5 Compliance with SCGs

This evaluation criterion evaluates each remedial alternative's ability to comply with New York State SCGs and Federal Applicable or Relevant and Appropriate Requirements (ARARs) that were identified in Section 2 and summarized in Tables 2-1, 2-2 and 2-3. Compliance with the following analysis factors were considered during the evaluation process:

- Chemical-specific SCGs
- Action-specific SCGs
- Location-specific SCGs

5.2.6 Overall Protection of Human Health and the Environment

This criterion provides an overall assessment of the protection of human health and the environment provided by each alternative. The assessment of overall protectiveness draws on the analysis of other criteria evaluated for each alternative (specifically short- and long-term effectiveness and compliance with SCGs). It also considers the manner in which the site-wide alternative achieves protection over time, the degree to which site risks would be reduced, and the manner in which each source of impacts would be eliminated, reduced, or controlled.

5.2.7 Cost

This criterion refers to the total cost to implement the remedial alternative on the basis of present worth analysis. Present worth analysis allows remedial actions to be compared on the basis of a single cost representing the amount that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the remedial actions over the planned life. The total cost of each alternative represents the sum of the direct capital costs (materials, equipment and labor), indirect capital costs (engineering, licenses or permits and contingency allowances), O&M costs (operating labor, energy, chemicals and sampling and analysis), and future capital costs (when appropriate, when there is reasonable expectation that a major component will require replacement).

The present worth costs were estimated with expected accuracies of -30 to +50 percent in accordance with both NYSDEC and USEPA guidance. Because detailed remedial design activities have not been performed, a 25 percent contingency has been included to each alternative account for potential changes in scope (and costs) that may be identified during the design and implementation activities. Present value costs are calculated for alternatives expected to last more than 2 years. In accordance with USEPA guidance, a 7 percent discount rate (before taxes and after inflation) was used to calculate present worth.

5.3 Detailed Evaluation of Alternatives

This section presents a detailed description of the retained alternatives for subsurface soil and groundwater, and an evaluation of each alternative with respect to the seven evaluation criteria described in Section 5.2.

5.3.1 Subsurface Soil

A total of four soil alternatives were developed for detailed analysis and include:

- Alternative SM1 – No Further Action
- Alternative SM2 – Remove Contents of Northern Gas Holder
- Alternative SM3 – Remove Northern Gas Holder and MGP-Impacted Material Above Confining Layer on Former MGP Property
- Alternative SM4 – Remove Northern Gas Holder and Soil Above 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use

5.3.1.1 Alternative SM1 – No Further Action

5.3.1.1.1 Technical Description

Alternative SM1 serves as the baseline for comparison of the overall effectiveness of the other remedial alternatives. The No Further Action alternative would not involve the implementation of active remedial measures to remove, treat, or contain MGP-impacted subsurface soil at the site. The site would be allowed to remain in its current condition. The existing cover material (i.e., gravel) and fencing on the former MGP property would be maintained. Institutional controls would be implemented to limit disturbance of the ground cover materials, place health and safety requirements on subsurface activities, and restrict groundwater use and/or groundwater extraction within the site. Such institutional controls may include:

- Governmental controls – land zoning restrictions, designation of water protection area, and local ordinance requiring construction permit
- Proprietary controls – deed modifications, standard easements, conservation easements, and/or covenants prohibiting certain activities on the property
- Informational devices – deed notices, advisories, and notifications

Several types of institutional controls may be “layered” or implemented in series to increase the protectiveness of the remedy (USEPA, 2000). The actual institutional controls implemented under this alternative would be determined in consultation with the NYSDEC. Periodic reports would be filed with the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective.

5.3.1.1.2 Short-Term Effectiveness

Under the No Further Action alternative, no active remedial action would be implemented for the MGP-impacted soil at the site; therefore, there would be no short-term risks to the community or construction workers, or impacts to the environment. No direct sources of greenhouse gas emissions (e.g., on site combustion of fuels) are associated with this alternative.

5.3.1.1.3 Long-Term Effectiveness

Based on current conditions, there is the potential for site/construction workers to be exposed to MGP impacts during intrusive activities. The long-term effectiveness of institutional controls would largely be determined by the extent to which governmental or private entities adopt and enforce them. The No Further Action alternative does not address the potential for an ongoing release and/or migration of MGP impacts to the environment, and; therefore is not considered to be effective on a long-term basis.

5.3.1.1.4 Reduction of Toxicity, Mobility, or Volume

Under the No Further Action alternative, MGP-impacted material and MGP-impacted soil would be left in place. Reduction of mass, mobility and toxicity of the impacts would potentially occur over an extended period of time as a result of natural processes. Overall, the No Further Action alternative is not considered an effective means of reducing the toxicity, mobility, or volume of the MGP-impacted material.

5.3.1.1.5 Implementability

The No Further Action alternative would be both technically and administratively implementable. No permit approval, and only minimal coordination with other agencies would be required. Implementation of institutional controls that would be inclusive of properties east of Hancock Street would require cooperation/approval from the current property owner(s).

5.3.1.1.6 Compliance with SCGs

Chemical-Specific SCGs

The No Further Action alternative would not remove, treat, or contain MGP-impacted material or MGP-impacted subsurface soil. Under this alternative, the potential human health exposures presented in Section 3.2.1 would remain, and the applicable SCGs identified in Table 2-1 would not be achieved in the foreseeable future until natural processes had reduced the MGP impacts.

Action-Specific SCGs

The No Further Action alternative would not involve the implementation of active remedial activities; therefore, the action-specific SCGs identified in Table 2-2 are not applicable.

Location-Specific SCGs

The No Further Action alternative would not involve the implementation of active remedial activities; therefore, the location-specific SCGs identified in Table 2-3 are not applicable.

5.3.1.1.7 Overall Protection of Human Health and the Environment

The No Further Action alternative is not considered an effective or “stand alone” means of reducing the toxicity, mobility, or volume of the MGP-impacted subsurface soil. The long-term effectiveness of institutional controls would largely be determined by the extent to which governmental or private entities adopt and enforce them. The No Further Action alternative does not sufficiently eliminate the potential for future release of MGP impacts from MGP-impacted material to the environment, and; therefore is not considered to be effective on a long-term basis. In addition, the No Further Action alternative does not eliminate or reduce, to the extent practicable, the source of MGP-related impacts. Therefore, the No Further Action alternative does not meet the RAOs for subsurface soil.

5.3.1.1.8 Cost

The estimated costs associated with Alternative SM1 are presented in Table 5-1. The total estimated 30-year present worth cost for implementation of this alternative is approximately \$190,000. The total estimated capital cost associated with implementation is approximately \$70,000. The total 30-year present worth cost of O&M associated with this alternative is approximately \$120,000.

5.3.1.2 Alternative SM2 - Remove Contents of Northern Gas Holder.

5.3.1.2.1 Technical Description

Alternative SM2 would involve the removal of the contents of the northern gas holder and the excavation and off-site disposal of heavily MGP-impacted material located above the groundwater table within the former MGP property, to the extent practicable. The removal of the gas holder structure is not included as a component of Alternative SM2 because it is anticipated that the structure will provide excavation support during removal of the contents of the holder. An evaluation of the ability to remove portions of the holder sidewalls without the requirement for additional sheet pile excavation support will be evaluated during the remedial design; however, removal of the holder sidewalls is not included in this alternative. Previous investigations indicate that the depth to the water table on the former MGP property is approximately 8 feet bgs in the area of the former northern gas holder. The approximate extent of MGP-impacted material located above the groundwater was determined based on the review of soil boring and excavation logs containing field observations of the presence/absence of visual MGP impacts. For the purposes of delineating and quantifying the MGP-impacted material removal area, site-specific characteristics (e.g., topography, site size, etc.) and constraints (e.g., location of electrical substation) were considered. As stated in Section 4.6, relocation of the substation, or interruption of electrical service to the Village of Fort Plan is not considered feasible. The approximated limits of excavation were therefore adjusted to consider these characteristics and constraints. The approximate limits of MGP-impacted material removal are shown on Figure 5-1.

Prior to the start of excavation activities, site preparation activities, including installation of temporary fencing and soil erosion control measures (i.e., silt fencing) would be installed.

Because the western side of the northern gas holder extends into the steep hillside, it is anticipated that stabilization of the hillside would be required. For the purposes of this Feasibility Study Report, it is anticipated that temporary steel sheet piling would be installed on the western side of the gas holder as excavation reinforcement to stabilize the hillside during excavation activities. Removal of the MGP-impacted material located on the northern and southern sides of the gas holder would be removed to groundwater, to the extent practicable. Stabilization adjacent to the sidewalk and northern utility poles would not be included in this alternative. It is estimated that sheet pile would be installed to a depth of approximately 20 to 30 feet bgs and be keyed into the silt and clay confining layer. The actual configuration, depth, type of sheet pile, and required bracing would be determined during the remedial design. Monitoring wells located within the excavation area would be abandoned. Due to the small size of the former MGP site and constraints with on-site equipment maneuverability and associated safety issues, vehicle and pedestrian traffic along Hancock Street would be diverted during implementation of Alternative SM2. A section of Hancock Street would be used as a work area and staging area, as required. Limited pumping and disposal of water that may have accumulated within the former gas holder is anticipated.

Photograph showing location of northern gas holder with respect to hillside; looking north.

Under this alternative, approximately 600 in-place cubic yards (cy) of soil would be excavated to access and remove approximately 450 cy of MGP-impacted material. Excavation would be conducted using conventional construction equipment, such as backhoes, front-end loaders, dump trucks, etc. Soil stabilization/dewatering is not anticipated because excavation activities would only take place above the water table. Amendment of soil, if required by the treatment/disposal facility, would occur in place. The existing at-grade concrete slab located to the north of the gas holder would be demolished, as required, to access MGP-impacted material in that area. The excavated MGP-impacted material and debris would be segregated and loaded directly into trucks for transportation/disposal. Due to limitations of the site and presence of overhead obstructions, it would be necessary stage and load trucks in Hancock Street.

Because heavily MGP-impacted soil exists below the groundwater table downgradient from former MGP property (i.e., beneath Hancock Street and beneath the parking area east of Hancock Street), management (i.e., containment) of such materials remaining below the water table on the former MGP property was evaluated; however, it was determined that such activities were not necessary and would not significantly increase the overall effectiveness of the alternative.

Excavated MGP-impacted material would be transported for off-site treatment by LTTD and disposal. Demolition debris (i.e., concrete slab) would be transported off-site for disposal at an approved landfill. Excavation and handling techniques would be employed to reduce the release of odors and/or organic vapors (polyethylene sheeting, misting with water, odor suppressants, etc.). Alternative SM2 would remove approximately 50 percent of the heavily MGP-impacted material on the former MGP property.

Separate phase NAPL that is encountered, if any, during excavation activities would be segregated, as practicable, and placed in the appropriate USDOT-approved containers (i.e., 55-gallons drums) for disposal.

The excavation areas would be backfilled in lifts with select fill material, compacted, and graded to within 6 inches of the original ground surface. A minimum of 6 inches of crushed stone, or similar, would then be placed over the top of the select fill. Following completion of the remedial action, cover materials and fencing would be maintained so that human health exposure pathway to remaining COCs would not exist. Additionally, following completion of the excavation and backfilling activities, a monitoring/recovery well would be installed within the southern gas holder and periodically gauged. Accumulated NAPL would be removed. An evaluation of the well installation method and construction details will be conducted during the remedial design.

Before the remedial design for this alternative is completed, a pre-design investigation (PDI) would likely be required. The PDI would include conducting an investigation to collect subsurface information to evaluate the geotechnical properties of soil in areas requiring excavation to support a sheet pile system design.

Institutional controls would be implemented that limit disturbance of the cover material, place health and safety requirements on subsurface activities, and restrict groundwater use and/or groundwater extraction within the site (former MGP property and commercial properties located east of Hancock Street). Institutional controls may include governmental controls, proprietary controls and informational devices (e.g., signs, postings, etc.) and would require approval of the current property owner(s). The actual institutional controls implemented under this alternative would be determined in consultation with the NYSDEC and affected property owner(s) during the remedial design. Periodic reports would be filed with the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective.

5.3.1.2.2 Short-Term Effectiveness

Management of excavation activities would be required to minimize potential short-term exposures to the community and site workers. Potential exposure mechanisms would include ingestion or dermal contact with MGP-impacted material and/or impacted media, inhalation of dust and/or volatized organic vapors and noise. Potential exposure of on-site workers to MGP impacts would be mitigated by the use of personal protective equipment (PPE) as specified in a site-specific health and safety plan (HASP), and by the use of engineering controls (e.g., use of water sprays and/or suppressants) so that dust, odors and/or volatized organic vapors are minimized to within acceptable levels. Community access to the site would be restricted to the site during the remedial activities by temporary fencing. A Community Air Monitoring Plan (CAMP) would be prepared and community air monitoring would be performed during implementation of this alternative to maintain compliance with air quality requirements, to minimize odors and to determine the need for additional engineering controls. Activities to control odors generated during the soil removal and handling activities would be evaluated (e.g., use of water misting sprays and/or suppressants, tarps to cover soil, minimizing open excavations, etc.) during the remedial design.

Additional worker safety concerns associated with working with and around large construction equipment, noise generation from operating construction equipment and increased vehicular traffic associated with transportation of excavated material from the site and delivery of backfill would be minimized by the use of engineering controls and appropriate health and safety practices. Short-term impacts to the community associated with transporting MGP-impacted soil off-site and clean fill materials on-site are anticipated to be manageable. The transportation activities would be managed to minimize en-route risks to the community. An evaluation of State Street relative to the capacity to accept the re-routed traffic has not been conducted as part of this Feasibility Study Report. Waste transport trucks would have watertight tailgates with a gasket between the box and the tailgate regardless of the designation of the load.

No significant impacts to health would be expected during the implementation of Alternative SM2 if control measures are properly planned and implemented. Completion of the remedial construction component of this alternative (including site preparation, sheet pile installation and removal, excavation and site restoration) would require approximately two months to complete.

The relative Carbon Footprint (i.e., relative contribution to greenhouse gas emissions for this alternative when compared to Alternatives SM1, SM3 and SM4) is considered low. Based on the excavation of a total of approximately 600 cy of soil, 12 cy load capacity of tractor trailers, and 4 trailers per day leaving the site and the installation and removal of temporary sheet pile, the construction component of this alternative is estimated to require approximately two months to complete. Therefore, the highest contribution to greenhouse gases would occur during this period when operation of heavy equipment, site support vehicles and trucks for transportation of excavated material would be required.

5.3.1.2.3 Long-Term Effectiveness

Alternative SM2 is considered effective on a long-term basis. The excavation/removal of MGP-impacted material located above the water table and the contents of the northern gas holder would result in a reduction of the source of MGP-related groundwater impacts resulting in improved groundwater quality. The removal of MGP-impacted material would also result in a reduction in the potential migration of MGP impacts. In addition, although the HHEA concluded that under current use there are no exposure routes to subsurface soil, Alternative SM2 would further reduce potential exposure associated with MGP-impacted subsurface soil. Placement of fill material and stone (surface cover) in the excavated areas and maintaining the existing surface cover at the former MGP property would mitigate potential contact with MGP-impacted subsurface soil that remain.

Periodic reports would be filed with the NYSDEC to demonstrate that the institutional controls and surface cover are being maintained. The effectiveness and permanence of the institutional controls would largely be determined by the extent to which governmental or private entities adopt and enforce them. In addition, natural attenuation processes would also continue to further reduce any MGP impacts in subsurface soil that may remain after implementing this alternative.

Over the long-term, Alternative SM2 would meet the RAOs developed for the site.

5.3.1.2.4 Reduction of Toxicity, Mobility, or Volume

This alternative would reduce the toxicity, mobility and volume of impacts at the site through the removal of the contents of the northern gasholder and MGP-impacted material on the former MGP property located above the water table. Approximately 900 cy of heavily MGP-impacted material are estimated to exist on the former MGP property. Alternative SM2 would remove approximately 450 cy of this material from the property (representing approximately 50 percent of the heavily MGP-impacted material on the former MGP property). The approximately 450 cy of MGP-impacted remaining material is located below the water table. It was determined that removal of this material would not significantly increase the overall effectiveness of this alternative considering:

- heavily MGP-impacted material that exists within the saturated zone downgradient of the former MGP property will remain in place following completion of the remedial activities
- site-specific features limiting the feasibility of removing or containing all of the heavily MGP-impacted material within the saturated zone on the former MGP property
- the lack of a human health exposure pathway to MGP-impacted soils following completion of this remedial alternative
- the known future use of the MGP property
- the downgradient edges of the dissolved plume is not migrating (i.e., the plume has stabilized)

5.3.1.2.5 Implementability

This alternative is both technically and administratively implementable. Excavation followed by off-site transportation, treatment and disposal are technically feasible and proven remedial construction activities at MGP sites. The removal and off-site transport of the impacted soil would be limited by the excavation rate and/or the rate at which the materials could be accepted at a treatment/disposal facility.

The equipment, materials and personnel (e.g., remedial action contractors, solid waste transporters) required to implement this alternative are anticipated to be readily available (i.e., no highly specialized equipment, materials, or personnel would be required). Coordination and/or planning would be required to confirm that adequate capacity is available at the selected treatment/disposal facility. Pre-design activities would be conducted to appropriately design the remedial action.

Alternative SM2 is implementable; however, some technical and administrative difficulties with implementation exist. These considerations include:

- Sheet pile design would need to consider site constraints that would preclude the use of tie backs for bracing.
- Due to the small size of the site, several remedial activities would need to be conducted in Hancock Street, such as staging areas, temporary water treatment system, decontamination area, and loading area for trucks.
- Pedestrian and vehicular traffic would be diverted during the excavation activities for approximately one month.
- Overhead obstructions associated with the electrical substation would limit the locations for sheet pile installation.

5.3.1.2.6 Compliance with SCGs

Chemical-Specific SCGs

Alternative SM2 would not immediately achieve compliance with SCGs. The clean backfill and stone surface cover would eliminate direct-contact exposure pathways to subsurface soil that contain MGP constituents for potential future site workers. Mitigation of future exposure to the subsurface soil by construction workers would be ensured through the implementation of the institutional controls and the use of appropriate PPE during intrusive activities.

Other applicable chemical-specific SCGs identified for this alternative are associated with the identification of hazardous waste (based on TCLP analysis), compliance with Universal Treatment Standards/Land Disposal Restrictions (UTS/LDRs), and DOT shipping requirements. These applicable chemical-specific SCGs would be achieved by completing appropriate characterization and profiling of the excavated soil prior to off-site transportation and treatment/disposal in accordance with applicable rules and regulations at a properly permitted facility. The NYSDEC's *Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants*, which outlines criteria for conditionally excluding MGP-tar and impacted soil/sediment from the

State hazardous waste requirements, would also be considered, as appropriate, when dealing with treatment/disposal of excavated materials. The SCGs for soil cleanup objectives, identified in Table 2-1, would not be achieved until natural processes had reduced the MGP impacts in soil.

Action-Specific SCGs

Implementation of this alternative would comply with action-specific SCGs, including both federal and New York State requirements. Action-specific SCGs include general health and safety requirements and general requirements regarding the handling and disposal of hazardous waste (including transportation and disposal, permitting, manifesting, disposal and treatment facilities).

Because MGP-impacted material typically only exhibits the hazardous characteristic of toxicity for benzene (D018), it is conditionally exempt from the hazardous waste management requirements (6 NYCRR Parts 370-374 and 376) when destined for thermal treatment in accordance with NYSDEC's TAGM 4061 (NYSDEC, 2002). If MGP-related hazardous wastes are destined for land disposal in New York State, the state hazardous waste regulations apply, including the LDRs and the alternative LDR treatment standards for hazardous waste soil.

The USDOT and New York State rules for the transport of hazardous materials are provided in 49 CFR Parts 107 and 171.1 through 172.558 and 6 NYCRR 372.3. These rules include procedures for the packaging, labeling, manifesting and transporting of hazardous materials and would be potentially applicable to the transport of hazardous materials under any remedial alternative. New York State requirements for waste transporter permits are included in 6 NYCRR Part 364 along with standards for the collection, transport and delivery of regulated wastes within New York State. Contractors transporting waste materials off-site during the selected remedial alternative would need to be properly permitted.

Alternative SM2 would comply with applicable requirements outlined under OSHA, including, but not limited to the general industry standards (29 CFR 1910), safety equipment and procedures to be followed during site remediation (29 CFR 1926), and recordkeeping and reporting-related regulations (29 CFR 1904). In addition to the requirements outlined under OSHA, the preparedness and prevention procedures, contingency plan and emergency procedures outlined under RCRA (40 CFR 264) are potentially relevant and appropriate.

Location-Specific SCGs

Alternative SM2 would comply with location-specific SCGs. Remedial activities would be designed and conducted in accordance with local codes and ordinances.

5.3.1.2.7 Overall Protection of Human Health and the Environment

Alternative SM2 would protect human health and the environment through the removal of the contents of the northern gas holder and MGP-impacted material located above the water table on the former MGP property, thereby reducing the toxicity, mobility and volume of COCs at the site. However, exposure via direct contact with subsurface soil and/or groundwater would potentially exist during construction/excavation activities. The potential exposure would be minimized by the use of institutional controls and PPE for workers conducting subsurface work. Removal of MGP-impacted material would reduce potential future human exposures and releases to the environment.

Overall, this alternative would achieve the RAOs for the site and provide protection of human health and the environment because:

- Approximately 450 cy of subsurface MGP-impacted material would be removed for off-site disposal.

- Potential future impacts to groundwater would be reduced by removal of MGP-impacted material from within the northern gas holder and from the unsaturated zone, which will reduce the potential for leaching of impacted material/COCs from within the unsaturated zone into the groundwater.

- Although the migration of the downgradient edge of the groundwater plume has stabilized, the potential loading of MGP-related COCs to the groundwater from the former MP property would be reduced.

5.3.1.2.8 Cost

The estimated costs associated with Alternative SM2, including assumptions made in developing this cost estimate and a detailed breakdown of the estimated costs, are presented in Table 5-2. The total estimated 30-year present worth cost for implementing this alternative is approximately $1,410,000. The total estimated capital cost associated with implementation of this alternative is approximately $1,290,000. The total 30-year present worth cost of annual O&M costs associated with this alternative is approximately $120,000.

5.3.1.3 Alternative SM3 - Remove Northern Gas Holder and MGP-Impacted Material Above Confining Layer on Former MGP Property

5.3.1.3.1 Technical Description

Alternative SM3 would include the removal of the northern gas holder and its contents and the excavation of heavily MGP-impacted material on the former MGP property to the silt and clay confining layer, to the extent practicable. Previous investigations indicate that the confining layer, a native silt and clay formation, exists at approximately 13 to 15 feet bgs in the area of the gas holder. This alternative includes the similar components as Alternative SM2; however, includes installation of additional sheet pile and removal of MGP-impacted material to a deeper depth. The excavated soil below the groundwater table would be protected from being re-impacted from soil that remains containing MGP impacts because, as presented in Section 1.4.4 and shown on Figure 1-3, the native silt and clay confining layer (and underling units) become deeper to the east/northeast (i.e., slope from the former MGP property toward the restaurant parking area). In addition, as also presented in Section 1.4.4, the groundwater gradient flow direction is from the former MGP property to the north and east. Impacted soil removed from the former MGP property would be upgradient from impacted soil that remained after Alternative SM3 was completed. Given these site characteristics, MGP-impacts would not be able to flow upgradient to impact the excavated areas; therefore, containment is not required.

For the purposes of delineating the soil removal area, the approximate extent of MGP-impacted material was determined based on the MVS model and review of soil boring logs containing visual observations of the presence/absence of MGP-impacts. For the purposes of delineating the practical soil removal area, site-specific characteristics (e.g., topography, site size, etc.) and constraints (e.g., location of electrical substation) were considered. As stated in Section 4.6, relocation of the substation, or interruption of electrical service to the Village of Fort Plan is not considered feasible. The practicable limits of excavation and estimated locations of sheet pile were therefore adjusted to consider these site characteristics and constraints. The approximate limits of MGP-impacted material removal are shown on Figure 5-2.

Similar to Alternative SM2, prior to the commencement of excavation, site preparation activities, including installation of temporary fencing and soil erosion control measures (i.e., silt fencing) would be installed. For the purposes of this Feasibility Study Report, it is anticipated that temporary watertight steel sheet piling would be installed at the perimeter of the excavation area to serve as excavation reinforcement to stabilize the excavation sidewalls and for dewatering purposes. It is anticipated that cantilevered sheet piling would be installed to a depth of approximately 45 feet bgs to provide adequate reinforcement, and that the use of internal bracing would be required. Because the western side of the northern gas holder extends into the foot of the steep hillside, it is anticipated that stabilization of the hillside would be required. The actual configuration, depth, type of sheet pile and bracing would be determined during the remedial design. Monitoring wells located within the excavation area would be abandoned. Due to the small size of the former MGP site and constraints with on-site equipment maneuverability and associated safety issues, vehicle and pedestrian traffic along Hancock Street would be diverted during implementation of SM3.

Under this alternative, a total of approximately 1,000 in-place cy of soil would require excavation to access and remove approximately 720 cy of MGP-impacted material. Excavation would be conducted using conventional construction equipment, such as backhoes, front-end loaders, dump trucks, etc. The existing at-grade concrete slab located north of the gas holder would be demolished, as required, to access MGP-impacted material in that area. The demolition debris from the concrete slab and the gas holder structure would be loaded directly into trucks staged in Hancock Street and transported off-site for disposal. Visually impacted soil excavated from above the groundwater table would also be directly loaded into trucks. Soil excavated from below the groundwater table would be staged in a temporary staging area to allow the soil to dewater prior to transportation from the site. Water generated during dewatering activities would be collected and transferred to an on-site storage tank prior to on-site treatment and disposal at a POTW.

During soil excavation activities, dewatering methods would be implemented to collect water from within the excavation areas and transfer it to an on-site storage tank. For cost estimating purposes, it was assumed that water generated during excavation and soil dewatering activities would be treated on-site using a temporary water treatment system prior to disposal. The dewatering methods would consist of water collection sumps installed within the excavation area. The volume of water was estimated assuming no precipitation, and the only water that infiltrated the excavation was through the bottom of the excavation or sheetpiling.

Excavated MGP-impacted material would be transported for off-site treatment by LTTD and disposal. Demolition debris would be transported to an approved landfill for disposal. Excavation and handling techniques would be employed to reduce the release of odors and/or organic vapors (polyethylene sheeting, misting with water, odor suppressants, etc.).

Separate phase NAPL that is encountered, if any, during excavation activities would be segregated from the other waste streams, as practicable, and placed in appropriate USDOT-approved containers (i.e., 55-gallon drums) for disposal.

The excavation areas would be backfilled in lifts with select fill material, compacted, and graded to within 6 inches of the original ground surface. An oxygen-releasing compound and/or other suitable treatment amendments (e.g., nutrients) will be added to the backfill material that is used below the groundwater table to stimulate growth of indigenous bacteria and enhance the degradation of dissolved MGP residuals. A minimum of 6 inches of crushed stone, or similar, would then be placed over the top of the select fill. Additionally, following completion of the excavation and backfilling activities, a monitoring/recovery well would be installed within the southern gas holder and periodically gauged. Accumulated NAPL would be removed. An evaluation of the well installation method and construction details will be conducted during the remedial design.

Before the remedial design for this alternative is completed, a PDI would likely be required. The PDI would include conducting an investigation to collect subsurface information to evaluate the geotechnical properties of soil in areas requiring excavation to support a sheet pile system design.

Following completion of the remedial action, surface cover materials and fencing would be maintained so that human health exposure pathway to remaining COCs would not exist. Institutional controls would be implemented that limit disturbance of the cover material, place health and safety requirements on subsurface activities, and restrict groundwater use and/or groundwater extraction within the site (former MGP property and commercial properties located east of Hancock Street). Institutional controls may include governmental controls, proprietary controls and informational devices (e.g., signs, postings, etc.) and would require approval of the current property owner(s). The actual institutional controls implemented under this alternative would be determined in consultation with the NYSDEC during the remedial design. Periodic reports would be filed with the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective.

5.3.1.3.2 Short-Term Effectiveness

Management of excavation activities would be required to minimize potential short-term exposures to the community and site workers. Potential exposure mechanisms would include ingestion or dermal contact with MGP-impacted material and/or impacted media, inhalation of dust and/or volatized organic vapors and noise. Potential exposure of on-site workers to MGP impacts would be mitigated by the use of PPE as specified in a site-specific HASP, and by the use of engineering controls (e.g., use of water sprays and/or suppressants) so that dust, odors, and/or volatized organic vapors are minimized to within acceptable levels. The community would not have access to the site during the remedial activities as temporary fencing would be constructed to restrict access. A CAMP would be prepared and community air monitoring would be performed during implementation of this alternative to maintain compliance with air quality requirements, to minimize odors and to determine the need for additional engineering controls. Activities to control odors generated during the soil removal and handling activities would be evaluated (e.g., use of water misting sprays and/or suppressants, tarps to cover soil, minimizing open excavations, etc.) during the remedial design.

Additional worker safety concerns associated with working with and around large construction equipment, noise generation from operating construction equipment, and increased vehicular traffic associated with transportation of excavated material from the site and delivery of backfill would be minimized by the use of engineering controls and appropriate health and safety practices. Short-term impacts to the community associated with transporting MGP-impacted soil off-site and clean fill materials on-site are anticipated to be manageable. The transportation activities would be managed to minimize en route risks to the community. An evaluation of State Street relative to the capacity to accept the re-routed traffic has not been conducted as part of this Feasibility Study Report. Waste transport trucks would have watertight tailgates with a gasket between the box and the tailgate regardless of the designation of the load.

No significant impacts to health would be expected during the implementation of Alternative SM3 if control measures are properly planned and implemented. Completion of the remedial construction component of this alternative (including site preparation, sheet pile installation and removal, excavation and site restoration) would require approximately 4 months.

The relative Carbon Footprint (i.e., relative contribution to greenhouse gas emissions for this alternative when compared to Alternatives SM1, SM2 and SM4) is considered moderate-to-high. Based on a total excavated volume of approximately 1,000 cy of soil, 12 cy load capacity of tractor trailers, and four trailers per day leaving the site, and the installation and removal of temporary sheet pile, the construction component of this alternative is estimated to require approximately 4 months to complete. Therefore, the highest contribution to greenhouse gases would occur during this period when operation of heavy equipment, site support vehicles, and trucks for transportation of excavated material would be required.

5.3.1.3.3 Long-Term Effectiveness

Alternative SM3 is considered effective on a long-term basis. The excavation/removal of the northern gas holder and its contents, and MGP-impacted material located above the confining layer on the former MGP property, would result in a reduction of the source of MGP-related groundwater impacts resulting in improved groundwater quality. The removal of MGP-impacted material would also result in a reduction in the potential migration of MGP impacts. In addition, although the HHEA concluded that under current use there are no exposure routes to subsurface soil, Alternative SM3 would further reduce potential exposure associated with MGP-impacted subsurface soil. Placement of fill material and stone (surface cover) in the excavated areas and maintaining the existing surface cover at the former MGP property would mitigate potential contact with MGP-impacted subsurface soil that remains.

Periodic reports would be filed with the NYSDEC to demonstrate that the institutional controls and surface cover are being maintained. The effectiveness and permanence of the institutional controls would largely be determined by the extent to which governmental or private entities adopt and enforce them. In addition, natural attenuation processes would also continue to further reduce any MGP impacts in subsurface soil that may remain after implementing this alternative.

Over the long-term, Alternative SM3 would meet the RAOs developed for the site.

5.3.1.3.4 Reduction of Toxicity, Mobility, or Volume

This alternative would significantly reduce the toxicity, mobility, and volume of impacts at the site through the removal of the northern gasholder and its contents and MGP-impacted material on the former MGP property located above the confining layer. Approximately 900 cy of heavily MGP-impacted material are estimated to exist on the former MGP property. Alternative SM3 would remove approximately 720 cy of this material from the property (representing approximately 80 percent of the heavily MGP-impacted material on the former MGP property).

5.3.1.3.5 Implementability

Excavation followed by off-site transportation, treatment and disposal are technically feasible and proven remedial construction activities at MGP sites. The removal and off-site transport of the impacted soil would be limited by the excavation rate and/or the rate at which the materials could be accepted at a treatment/disposal facility.

The equipment, materials, and personnel (e.g., remedial action contractors, solid waste transporters) required to implement this alternative are anticipated to be readily available (i.e., no highly specialized equipment, materials, or personnel would be required). Coordination and/or planning would be required to confirm that adequate capacity is available at the selected treatment/disposal facility. Pre-design activities would be conducted to appropriately design the remedial action.

Alternative SM3 is implementable; however, technical and administrative difficulties with implementation exist. These considerations include:

- Sheet pile design would need to consider site constraints that would preclude the use of tie backs for bracing.

- Due to the small site size and increased space requirements, several remedial activities would need to be conducted in Hancock Street, such as staging areas, temporary water treatment system, decontamination area, and a loading area for trucks.

- Pedestrian and vehicular traffic would be diverted during the excavation activities for approximately one to two months.

- Overhead obstructions associated with the electrical substation would limit the locations for sheet pile installation.

5.3.1.3.6 Compliance with SCGs

Chemical-Specific SCGs

Alternative SM3 would not immediately achieve compliance with SCGs in all media. The clean backfill and stone surface cover would eliminate direct-contact exposure pathways to remaining subsurface soil that contain MGP constituents for potential future site workers. Mitigation of potential future exposure to the subsurface soil by construction workers would be ensured through the implementation of the institutional controls and the use of appropriate PPE during intrusive activities.

Other applicable chemical-specific SCGs identified for this alternative are associated with the identification of hazardous waste (based on TCLP analysis), compliance with Universal Treatment Standards/Land Disposal Restrictions (UTS/LDRs), and DOT shipping requirements. These applicable chemical-specific SCGs would be achieved by completing appropriate characterization and profiling of the excavated soil prior to off-site transportation and treatment/disposal in accordance with applicable rules and regulations at a properly permitted facility. The NYSDEC's *Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants*, which outlines criteria for conditionally excluding MGP-tar and impacted soil/sediment from the State hazardous waste requirements, would also be considered, as appropriate, when dealing with treatment/disposal of excavated materials. The SCGs for soil cleanup objectives, identified in Table 2-1, would not be achieved until natural processes had reduced the MGP impacts in soil.

Action-Specific SCGs

Implementation of this alternative would comply with action-specific SCGs, including both federal and New York State requirements. Action-specific SCGs include general health and safety requirements and general requirements regarding the handling and disposal of hazardous waste (including transportation and disposal, permitting, manifesting, disposal and treatment facilities).

Because MGP-impacted material typically only exhibits the hazardous characteristic of toxicity for benzene (D018), it is conditionally exempt from the hazardous waste management requirements (6 NYCRR Parts 370-374 and 376) when destined for thermal treatment in accordance with NYSDEC's TAGM 4061 (NYSDEC, 2002). If MGP-related hazardous wastes are destined for land disposal in New York State, the state hazardous waste regulations apply, including the LDRs and the alternative LDR treatment standards for hazardous waste soil.

The U.S. Department of Transportation (USDOT) and New York State rules for the transport of hazardous materials are provided in 49 CFR Parts 107 and 171.1 through 172.558 and 6 NYCRR 372.3. These rules include procedures for the packaging, labeling, manifesting and transporting of hazardous materials and would be potentially applicable to the transport of hazardous materials under any remedial alternative. New York State requirements for waste transporter permits are included in 6 NYCRR Part 364 along with standards for the collection, transport and delivery of regulated wastes within New York State. Contractors transporting waste materials off-site during the selected remedial alternative would need to be properly permitted.

Alternative SM3 would comply with applicable requirements outlined under OSHA, including, but not limited to the general industry standards (29 CFR 1910), safety equipment and procedures to be followed during site remediation (29 CFR 1926), and recordkeeping and reporting-related regulations (29 CFR 1904). In addition to the requirements outlined under OSHA, the preparedness and prevention procedures, contingency plan and emergency procedures outlined under RCRA (40 CFR 264) are potentially relevant and appropriate.

Location-Specific SCGs

Alternative SM3 would comply with location-specific SCGs. Remedial activities would be designed and conducted in accordance with local codes and ordinances.

5.3.1.3.7 Overall Protection of Human Health and the Environment

Alternative SM3 would protect human health and the environment through the removal of the northern gas holder and its contents and MGP-impacted material located above the confining layer on the former MGP property, thereby reducing the toxicity, mobility and volume of COCs at the site. However, exposure via direct contact with subsurface soil and/or groundwater would potentially exist during construction/excavation activities. The potential exposure would be minimized by the use of engineering controls and PPE for workers conducting subsurface site work. Removal of MGP-impacted material would reduce potential future human exposures and releases to the environment.

Overall, this alternative would achieve the RAOs for the site and provide protection of human health and the environment because:

- Approximately 720 cy of MGP-impacted material would be removed for off-site disposal.
- Impacts to groundwater would be reduced by the removal of MGP-impacted material.
- Although the overall groundwater plume is stabilized, the potential for migration of dissolved MGP-related COCs from the former MGP site would be reduced.

5.3.1.3.8 Cost

The estimated costs associated with Alternative SM3, including assumptions made in developing this cost estimate and a detailed breakdown of the estimated costs, are presented in Table 5-3. The total estimated 30-year present worth cost for implementing this alternative is approximately $2,520,000. The total estimated capital cost associated with implementation of this alternative is approximately $2,400,000. The total 30-year present worth cost of annual O&M costs associated with this alternative is approximately $120,000.00.

5.3.1.4 Alternative SM4 – Remove Northern Gasholder and Soil Above 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use.

5.3.1.4.1 Technical Description

Alternative SM4 represents the largest removal of subsurface soil and; therefore, the most aggressive subsurface soil remediation alternative. Alternative SM4 includes the removal of the northern gas holder and its contents along with the excavation/removal of soil within the site containing COCs exceeding the individual 6 NYCRR Part 375 Commercial Restricted Use Soil Cleanup Objectives (6 NYCRR Part 375 commercial criteria) located above the silt and clay confining layer, to the extent practicable. This alternative includes removal of subsurface soil located on the former MGP property and the commercial properties located east of Hancock Street. Due to lack of exposure pathways and significant hindrances to technical and administrative implementability, the NYSDEC has agreed (pursuant to the March 2007 meeting) that soil containing COCs above 6 NYCRR Part 375 commercial criteria that may exist beneath Hancock Street, if any, would not be included in this alternative. Demolition of Hancock Street, temporary relocation of utilities that exist beneath Hancock Street (including a sewer line, storm sewer, water supply line, and gas line), and relocation of the overhead electrical lines that exist along the east side of Hancock Street is not feasible. In addition, excavation/removal of soil exceeding 6 NYCRR Part 375 commercial criteria that exists beneath State Street, if any, or beneath the electrical lines that exist above the southern end of the restaurant parking area is also not feasible, and therefore, not included in this alternative.

Similar to Alternatives SM2 and SM3, the approximate extent of heavily MGP-impacted material and soil exceeding 6 NYCRR Part 375 commercial criteria was determined based on the MVS model, review of soil boring logs and observation recorded on the logs, and review of site characterization data, in addition to engineering judgment. For the purposes of delineating the practicable soil removal areas, site-specific constraints (e.g., location of electrical substation) and obstructions were considered. As stated in Section 4.6, relocation of the substation, or interruption of electrical service to the Village of Fort Plain is not considered feasible. The approximate horizontal and vertical limits of excavation are shown on Figure 5-3. The depth of excavation would range from approximately 8 to 16 feet bgs on the former MGP property, and from approximately 19 to 24 feet bgs in the properties located east of Hancock Street. Excavation conducted on the properties located east of

Hancock Street would involve the excavation and removal of the former Erie Canal structure and fill material.

Under this alternative, approximately 4,600 cy of soil and debris would be excavated to access and remove approximately 1,500 cy of MGP-impacted soil and debris for off-site disposal. Prior to the commencement of excavation, soil erosion measures would be installed. Temporary watertight steel sheet piling would be installed at the perimeter of excavated areas to serve as excavation reinforcement and for groundwater dewatering. For the purposes of this Feasibility Study Report, it is anticipated that sheet piling would be installed to depths ranging between approximately 40 to 50 feet bgs around the excavation depending on the depth of required excavation at a specific location. It is anticipated that sheet piling would require the use of tie backs and/or bracing. The actual configuration, depths and type(s) of sheet pile would be determined during the remedial design. Due to their proximity to excavation areas requiring sheet pile, a structural survey of the restaurant facility and commercial property located south of the restaurant parking area would be completed prior to initiating installation activities. The purpose of the structural survey would be to document to building conditions prior to the start of construction activities. Monitoring wells located within the excavation area would be abandoned. Vehicle and pedestrian traffic along Hancock Street would be diverted during implementation of SM4. It is anticipated that for health and safety reasons, during construction activities in the parking area located in front of the restaurant, operation of the restaurant would be temporarily suspended.

As in Alternatives SM2 and SM3, MGP-impacted soil excavated from above the groundwater table would be directly loaded into trucks staged in Hancock Street. Soil that does not contain visible evidence of MGP impacts and soil excavated from below the groundwater table would be moved to staging areas for dewatering and testing prior to off-site transportation and disposal. Demolition materials associated with the removal of the gasholder (i.e., concrete, masonry), concrete slab located on the former MGP site, and other debris removed during excavation (e.g., side wall of former Erie Canal) would also be directly loaded into trucks and transported off-site for disposal. Water generated during soil dewatering activities would be collected and transferred to an on-site storage tank prior to on-site treatment and disposal at the POTW. The excavation activities would be conducted using conventional construction equipment, such as backhoes, front-end loaders, dump trucks, etc.

Separate phase NAPL (if any) encountered during excavation activities would be segregated from the other waste streams (to the extent possible) and placed in appropriate USDOT-approved containers (i.e., 55-gallon drum) for disposal.

During soil excavation activities, dewatering methods would be implemented to collect water from within the excavation areas and transfer it to an on-site storage tank prior to on-site treatment and off-site disposal. The dewatering method would likely consist of water collection sumps installed within the excavation.

For the purposes of this Feasibility Study Report, excavated soil would be transported for off-site treatment by LTTD and disposal. Demolition debris would be transported off-site for disposal at a landfill. Excavation and soil handling techniques would be employed to reduce the release of odors and/or organic vapors (polyethylene sheeting, misting with water, odor suppressants).

The excavation areas would be backfilled with select fill material to within 6 inches of the original ground surface. An oxygen-releasing compound and/or other suitable treatment amendments (e.g., nutrients) will be added to the backfill material that is used below the groundwater table to stimulate growth of indigenous bacteria and enhance the degradation of dissolved MGP residuals. Site restoration would include finishing the ground surface to pre-excavation conditions in areas located east of Hancock Street, and with 6 inches of crushed stone, or similar, at locations on the former MGP property. Additionally, following completion of the excavation and backfilling activities, a monitoring/recovery well would be installed within the southern gas holder and periodically gauged. Accumulated NAPL would be removed. An evaluation of the well installation method and construction details will be conducted during the remedial design.

Following completion of the remedial action, surface cover materials and site fencing would be maintained at the former MGP property so that no human health exposure to remaining COCs would exist (e.g., in the area of the utility poles/electric substation). Also, because COCs above 6 NYCRR Part 375 commercial criteria would also remain (on the former MGP property, beneath and immediately adjacent to Hancock Street, and adjacent to State Street), institutional controls would be implemented that limit disturbance of the cover materials, place health and safety requirements on subsurface activities, and restrict groundwater use and/or groundwater extraction within the site. Such institutional controls may include governmental controls, proprietary controls, and informational devices (e.g., signs, postings, etc.). The actual institutional controls implemented under this alternative would be determined in consultation with the NYSDEC. Periodic reports would be filed with the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective.

5.3.1.4.2 Short-Term Effectiveness

Management of construction activities would be required to minimize potential short-term exposures to the community and site workers. Potential exposure mechanisms would include ingestion or dermal contact with impacted media, inhalation of dust and/or volatized organic vapors, and noise. Potential exposure of on-site workers to MGP impacts would be mitigated by the use of PPE as specified in a site-specific health and safety plan, and by the use of engineering controls (e.g., use of water sprays and/or suppressants, modifying the rate of construction activities, etc.) so that dust, odors and/or volatized organic vapors are within acceptable levels. The community would not have access to the site during the remedial activities as temporary fencing would be constructed during construction activities. A CAMP would be prepared and community air monitoring would be performed during implementation of this alternative to maintain compliance with air quality requirements, to minimize odors, and to determine the need for additional engineering controls. Activities to control odors generated during the soil removal and handling activities would be evaluated (e.g., use of water misting sprays and/or suppressants, tarps to cover soil, minimizing open excavations, etc.) during the remedial design.

Additional worker and community safety concerns associated with working with and around large construction equipment, noise generation from operating construction equipment, and increased vehicular traffic associated with transportation of excavated material from the site and delivery of backfill would be minimized by the use of engineering controls and appropriate health and safety practices. Short-term impacts to the community associated with transporting impacted soil off-site and clean fill materials on-site are anticipated to be high. The transportation activities would be managed to minimize en-route risks to the community. Waste transport trucks would have watertight tailgates with a gasket between the box and the tailgate regardless of the designation of the load.

It is anticipated that impacts to the community would include closure of the restaurant during portions of the construction activities, and re-routing of pedestrian and vehicular traffic during the entire construction project. An evaluation of State Street relative to the capacity to accept the re-routed traffic has not been conducted as part of this Feasibility Study Report.

Completion of the remedial construction component of this alternative (including site preparation, sheet pile installation and removal, excavation and site restoration) would require approximately 6 months.

The relative Carbon Footprint (i.e., relative contribution to greenhouse gas emissions for this alternative when compared to Alternatives SM1, SM2 and SM3) is considered high. Based on approximately 4,600 cy of soil, 12 cy load capacity of tractor trailers, and four trailers per day leaving the site, and the installation and removal of temporary sheetpile, the construction component of this alternative is estimated to require approximately 6 months to complete. Due to the required coordination, multiple mobilizations for sheetpile installation and removal, site restoration etc., Alternative SM4 would likely be completed over two construction seasons. The greatest contribution to greenhouse would occur during this period when operation of heavy equipment, site support vehicles and trucks for transportation of excavated material would be required. This alternative represents the largest carbon footprint of the subsurface soil alternatives.

5.3.1.4.3 Long-Term Effectiveness

Alternative SM4 is considered effective on a long-term basis. The excavation/removal of MGP-impacted material, subsurface soil containing constituents above their individual 6 NYCRR Part 375 commercial criteria, and the northern gas holder and its contents would result in a reduction in the source of MGP-related groundwater impacts and a reduction in the potential migration of MGP impacts. In addition, although the HHEA concluded that under current use there are no exposure routes to subsurface soil, Alternative SM4 would further reduce potential human exposure associated with MGP-impacted subsurface soil. Placement of fill material and crushed stone in the excavated areas on the former MGP property and replacing cover materials in the areas east of Hancock Street would mitigate potential contact with COCs that remain.

Periodic reports would be filed with the NYSDEC to demonstrate that the institutional controls and surface cover on the former MGP site are being maintained. The effectiveness and permanence of the institutional controls would largely be determined by the extent to which governmental or private entities adopt and enforce them. In addition, natural attenuation processes would also continue to further reduce COCs in subsurface soil that remain after implementing this alternative.

Alternative SM4 would meet the RAOs developed for the site.

5.3.1.4.4 Reduction of Toxicity, Mobility, or Volume

This alternative would reduce the toxicity, mobility and volume of impacts at the site through the removal of the MGP-impacted material and the removal of impacted subsurface soil containing COCs exceeding their individual 6NYCRR Part 375 commercial criteria.

However, similar to Alternatives SM2 and SM3, soil containing COCs and NAPL, that may exist beneath Hancock Street or State Street, or beneath the electrical lines that exist above the southern end of the restaurant parking area, will remain after this alternative has been implemented. Approximately 1,600 cy of heavily MGP-impacted material and soil with COCs exceeding 6NYCRR Part 375 commercial criteria are estimated to exist at the site. Alternative SM4 would remove approximately 1,500 cy of this material from the site. However, approximately 4,600 cy of soil would require excavation and handling to remove this quantity of heavily MGP-impacted material, due primarily to the depth of the material east of Hancock Street.

5.3.1.4.5 Implementability

Excavation followed by off-site transportation, treatment and disposal are technically feasible and proven remedial construction activities at MGP sites. The removal and off-site transport of the impacted soil would be limited by the excavation rate and/or the rate at which the materials could be accepted at a treatment/disposal facility. The equipment, materials and personnel (e.g., remedial action contractors, solid waste transporters) required to implement this alternative are anticipated to be readily available (i.e., no highly specialized equipment, materials, or personnel would be required). Coordination and/or planning would be required to confirm that adequate capacity is available at the selected treatment/disposal facility. However, site-specific characteristics and logistics limit the technical implementability of this alternative. These constraints include:

- Existing electrical substation on former MGP property. Subsurface soil containing COCs above 6 NYCRR Part 375 criteria exist near the northern utility poles. As stated above, interruption of the electrical service to the Village of Fort Plain, and/or relocation of the electrical substation during any remedial action is not considered feasible.

- Existing overhead obstructions located east of Hancock Street. Overhead distribution and transmission lines from the electrical substation exist in the southern end of the restaurant parking area, north of the frame building (top adjoining photograph). These electrical lines run in an east-west direction and would restrict the installation of sheet pile beneath and immediately adjacent to the lines, in an area identified with subsurface soil containing COCs greater than 6 NYCRR Part 375 commercial criteria at depths to 24 feet bgs. In addition, overhead electrical lines exist in a north-south direction along the eastern side of Hancock Street (bottom adjoining photograph). These lines also restrict the installation of sheet pile beneath and immediately adjacent to the lines, in an additional area identified with subsurface soil containing COCs greater than 6 NYCRR Part 375 commercial criteria at depths to 20 feet bgs. Relocation of these lines would be necessary to allow sheet piling installation to be conducted in a safe manner. This is not considered feasible

- Existing underground utilities located east of Hancock Street. Underground natural gas lines exist along the eastern side of Hancock Street and along the western side of State Street. Both gas lines exist in areas identified with subsurface soil containing COCs greater than 6 NYCRR Part 375 commercial criteria at depths of approximately 20 to 24 feet bgs. Both gas lines would require re-routing prior to installation of sheet piling.

View from Hancock Street facing east across restaurant parking area.

View along the east side of Hancock Street, facing south.

- Sheet pile design constraints. Due to site size constraints of the site, and the proximity of deep impacts to Hancock Street, State Street and the restaurant, the use of tie backs for stability of sheet piling is limited, if even practicable.

- Presence of former Erie Canal. The walls of the former Erie Canal still exist and are constructed of limestone block. According to the former historian for the Village of Fort Plain, the former canal was filled with rip-rap, fill dirt, and other materials (e.g., wood). Excavation and removal of the former canal structure and contents would be difficult to implement.

This alternative also has limited administrative implementability. Difficulties with implementation of this alternative include:

- Access to the properties located east of Hancock Street. National Grid does not own the properties located east of Hancock Street. Permission/legal consent would be required for National Grid to conduct excavation/construction work at those locations.

- It is anticipated that the restaurant would be required to close during portions of the construction activities conducted east of Hancock Street.

- Closure of Hancock Street. It is anticipated that Hancock Street would require closure for the duration of the construction/excavation activities. Construction/excavation activities are estimated to require approximately 7 months (including site preparation, sheet pile installation and removal, excavation and site restoration). It is anticipated that these field activities would be conducted over two construction seasons. An evaluation of State Street relative to the capacity to accept the re-routed traffic for this period of time has not been conducted as part of this Feasibility Study Report.

Significant issues with both technical and administrative implementability exist with alternative SM4.

5.3.1.4.6 Compliance with SCGs

<u>Chemical-Specific SCGs</u>

Alternative SM4 would not immediately achieve compliance with SCGs in all media because subsurface soil containing COCs would remain at the completion of this alternative. The clean backfill and stone surface cover would eliminate direct-contact exposure pathways to subsurface soil that contain MGP constituents for potential future site workers. Mitigation of potential future exposure to the subsurface soil by construction workers would be ensured through the implementation of the institutional controls and the use of appropriate PPE during intrusive activities.

Other applicable chemical-specific SCGs identified for this alternative are associated with the identification of hazardous waste (based on TCLP analysis), compliance with Universal Treatment Standards/Land Disposal Restrictions (UTS/LDRs), and DOT shipping requirements. These applicable chemical-specific SCGs would be achieved by completing appropriate characterization and profiling of the excavated soil prior to off-site transportation and treatment/ disposal in accordance with applicable rules and regulations at a properly permitted facility. The NYSDEC's *Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants*, which outlines criteria for conditionally excluding MGP-tar and impacted soil/sediment from the State hazardous waste requirements, would also be considered, as appropriate, when dealing with treatment/disposal of excavated materials. The SCGs for soil cleanup objectives, identified in Table 2-1, would not be achieved until natural processes had reduced the MGP impacts in soil.

Action-Specific SCGs

Implementation of this alternative would comply with action-specific SCGs, including both federal and New York State requirements. Action-specific SCGs include general health and safety requirements and general requirements regarding the handling and disposal of hazardous waste (including transportation and disposal, permitting, manifesting, disposal and treatment facilities).

Because MGP-impacted material typically only exhibits the hazardous characteristic of toxicity for benzene (D018), it is conditionally exempt from the hazardous waste management requirements (6 NYCRR Parts 370-374 and 376) when destined for thermal treatment in accordance with NYSDEC's TAGM 4061 (NYSDEC, 2002). If MGP-related hazardous wastes are destined for land disposal in New York State, the state hazardous waste regulations apply, including the LDRs and the alternative LDR treatment standards for hazardous waste soil.

The USDOT and New York State rules for the transport of hazardous materials are provided in 49 CFR Parts 107 and 171.1 through 172.558 and 6 NYCRR 372.3. These rules include procedures for the packaging, labeling, manifesting and transporting of hazardous materials and would be potentially applicable to the transport of hazardous materials under any remedial alternative. New York State requirements for waste transporter permits are included in 6 NYCRR Part 364 along with standards for the collection, transport and delivery of regulated wastes within New York State. Contractors transporting waste materials off-site during the selected remedial alternative would need to be properly permitted.

A remedial alternative conducted within the site would comply with applicable requirements outlined under OSHA, including, but not limited to the general industry standards (29 CFR 1910), safety equipment and procedures to be followed during site remediation (29 CFR 1926), and recordkeeping and reporting-related regulations (29 CFR 1904). In addition to the requirements outlined under OSHA, the preparedness and prevention procedures, contingency plan and emergency procedures outlined under RCRA (40 CFR 264) are potentially relevant and appropriate.

Location-Specific SCGs

Remedial activities would be conducted in accordance with local codes and ordinances.

5.3.1.4.7 Overall Protection of Human Health and the Environment

Alternative SM4 would protect human health and the environment through the excavation and off-site disposal of the contents of the northern gas holder, MGP-impacted material, and subsurface soil containing COCs exceeding 6 NYCRR Part 375 commercial criteria, thereby reducing the toxicity, mobility and volume of COCs at the site. However, exposure via direct contact with subsurface soil and groundwater would potentially exist during the extended construction/excavation activities. The exposure would be minimized by the use of engineering controls and PPE for workers conducting subsurface site work.

Overall, this alternative would achieve the RAOs for the site and provide protection of human health and the environment because:

- Approximately 1,500 cy of subsurface soil containing COCs above 6 NYCRR Part 375 commercial criteria and/or MGP-impacted material would be removed for off-site treatment and/or disposal.

- Impacts to groundwater would be reduced by the removal of MGP-impacted material and soil containing COCs above 6 NYCRR Part 375 commercial criteria.

- Although the overall dissolved BTEX and PAH plume is stabilized, the potential for migration of dissolved MGP-related COCs from the former MGP property would be reduced.

While Alternative SM4 represents the removal of the largest volume of MGP-impacted material, it does not effectively increase the overall protection of human health, or reduce risks remaining after the remediation objectives have been met. The HHEA concluded that there are no existing exposure routes to subsurface soil or to groundwater, and although Alternative SM4 includes removal of the largest volume of MGP-impacted soil, it still leaves some MGP-impacted material in place. Therefore, Alternative SM4 does not provide a significantly greater protection to human health; institutional controls would still be required. Implementation of Alternative SM4 would include the removal of soil containing analytes with concentrations above Part 375 criteria, including chemicals from operations not related to the historic MGP operations (e.g., historical auto repair shop, welding shop, machine shop). Alternative SM4, therefore; represents significantly greater short-term impacts, exposures, and disruptions to the community over a longer period of time than Alternatives SM2 and SM3 and increased contribution to greenhouse gases. The ability to re-route traffic around Hancock Street would present significant difficulties.

5.3.1.4.8 Cost

The estimated costs associated with Alternative SM4, including assumptions made in developing this cost estimate and a detailed breakdown of the estimated costs, are presented in Table 5-4. The total estimated 30-year present worth cost for implementing this alternative is approximately $7,710,000. The total estimated capital cost associated with implementation of this alternative is approximately $ 7,600,000. The total 30-year present worth cost of annual O&M costs associated with this alternative is approximately $120,000.

5.3.2 Groundwater

A total of three groundwater alternatives were developed for detailed analysis and include:

- Alternative GW1 – No Further Action
- Alternative GW2 – Monitored Natural Attenuation
- Alternative GW3 – Enhanced Natural Degradation

5.3.2.1 Alternative GW1 – No Further Action

5.3.2.1.1 Technical Description

The No Further Action alternative serves as the baseline for comparison of the overall effectiveness of the other remedial alternatives. The No Further Action alternative would not involve the implementation of active remedial activities to remove, treat, or contain MGP-impacted groundwater. The site groundwater would be allowed to remain in its current condition, and no active effort would be made to change the current conditions. Institutional controls in the form of governmental, enforcement, or permit controls that would restrict groundwater use and/or groundwater extraction within the dissolved plume would be implemented.

5.3.2.1.2 Short-Term Effectiveness

Under the No Further Action alternative, no active remedial action would be implemented for the impacted groundwater; therefore, there would be no short-term risks to the community or site workers.

5.3.2.1.3 Long-Term Effectiveness

The MGP-related COCs dissolved in groundwater (specifically dissolved BTEX and PAHs) would not be actively addressed; however, as presented in Section 1.5, the dissolved BTEX and PAH plumes are well defined and appear to be stabilized. The No Further Action alternative does not document the natural attenuation of COCs over time. It is anticipated that institutional controls would reduce potential human exposures. Overall, the No Further Action alternative is considered effective on a long-term basis.

5.3.2.1.4 Reduction of Toxicity, Mobility, or Volume

Under the No Further Action alternative, MGP-impacted groundwater would not be contained, removed or actively treated. Therefore, the toxicity, mobility and volume of COCs present in groundwater would not be reduced, except by long-term natural processes. The reduction in toxicity, mobility, or volume of the MGP impacts would not be monitored/documented as part of this alternative.

5.3.2.1.5 Implementability

The No Further Action alternative is both technically and administratively implementable. No permit approval or coordination with other agencies would be required. Implementation of institutional controls for the properties located east of Hancock Street would require the approvals of the current property owner(s). Selection of appropriate institutional controls would be performed in consultation with the NYSDEC and the current property owner(s) during the remedial design.

5.3.2.1.6 Compliance with SCGs

<u>Chemical-Specific SCGs</u>

As presented above, the No Further Action alternative would not contain, remove or treat impacted groundwater or the sources of MGP impacts. For this alternative, the potential direct contact exposures for site workers performing intrusive construction activities would remain, and the applicable SCGs identified in Table 2-1 would not be achieved until natural processes had reduced the impacts. Because of these natural processes, through time this alternative would be expected to achieve the RAOs for groundwater.

Action-Specific SCGs

Because this alternative does not include the implementation of active remedial activities, the action-specific SCGs identified in Table 2-2 are not applicable.

Location-Specific SCGs

The No Further Action alternative does not involve the implementation of any remedial activities; therefore, the location-specific SCGs identified in Table 2-3 are not applicable.

5.3.2.1.7 Overall Protection of Human Health and the Environment

The No Further Action alternative does not include active remedial activities; therefore, there would be no short-term risks to the community. As presented in Section 1.5.3, historical groundwater data suggests that the dissolved BTEX and PAH plumes are stabilized and natural attenuation and biodegradation processes have been effective components in controlling downgradient migration. However, this alternative would not monitor/document the reduction in toxicity, mobility, or volume of the MGP impacts. Because of these natural processes, this alternative would be expected to achieve the RAOs for groundwater through time. It is anticipated that institutional controls would reduce potential exposures to site construction workers. Overall, the No Further Action alternative is considered moderately protective of human health and the environment.

5.3.2.1.8 Cost

The estimated costs associated with this alternative, including assumptions made in developing this cost estimate and a detailed breakdown of the estimated costs, are presented in Table 5-6. The total estimated 30-year present worth cost for implementing this alternative is approximately $140,000. The total estimated capital cost associated with implementation of this alternative is approximately $60,000. The total 30-year present worth cost of annual O&M costs associated with this alternative is approximately $80,000.

5.3.2.2 Alternative GW2 – Monitored Natural Attenuation

5.3.2.2.1 Technical Description

Under Alternative GW2, a groundwater monitoring program would be conducted to monitor natural degradation of dissolved MGP-related COCs at the site. As presented in Section 1.5, preliminary evaluation of the monitored natural attenuation of dissolved BTEX and

PAHs supports the general conclusion that natural attenuation and biodegradation processes are active and, at a minimum, have been effective in controlling downgradient migration of the edge of the dissolved COC plume (i.e., stabilizing plume migration). Additionally, the monitoring well installed within the limits of the southern gas holder would be gauged periodically.

The groundwater monitoring program would be conducted to monitor dissolved BTEX and PAHs in groundwater. For the purposes of this Feasibility Study Report, it was assumed that sampling of the groundwater for laboratory analysis would be conducted semi-annually for a five year period to document natural attenuation, and would be conducted using eight existing monitoring wells (MW-2, MW-3, MW-4, MW-5alt, MW-7, MW-8, MW-9 and MW-10). Monitoring wells previously lost (MW-5alt) or abandoned/lost during excavation activities would be reinstalled.

The results of the groundwater monitoring would be summarized and presented to NYSDEC in annual reports. After a five year period, an evaluation of the long-term monitoring would be made and presented to the NYSDEC. Based on the analytical results and trends in groundwater COC concentrations, National Grid would propose modifications to the monitoring program. For the purposes of this Feasibility Study Report, it is assumed that annual sampling to document MNA would be conducted for an additional 25 years (i.e., for a total of 30 years).

In addition, institutional controls would be implemented to limit the use of groundwater containing COCs above NYSDEC Class GA standards and guidance values. National Grid would work with the NYSDEC and the current property owner(s) to implement institutional controls in the form of governmental, enforcement, or permit controls that would limit disturbance of the groundwater monitoring network and restrict groundwater use and/or groundwater extraction within the site.

5.3.2.2.2 Short-Term Effectiveness

Implementation of Alternative GW2 could result in the exposure of site workers to MGP impacts during well installation and groundwater gauging and sampling activities. Potential exposure mechanisms would include ingestion or dermal contact with impacted groundwater and/or soil (during monitoring well installation) and inhalation of volatized organic vapors. Potential exposure of workers to MGP impacts would be mitigated by the use of PPE and monitoring, as specified in a site-specific HASP.

There would be minimal increased risks to the community as a result of implementation of this alternative (e.g., dust during well installation); however, monitoring and engineering controls could easily be implemented to mitigate potential risks. Therefore, no significant impacts to health or the environment during implementation of this alternative would be expected. Alternative GW2 therefore meets the short-term effectiveness criterion.

5.3.2.2.3 Long-Term Effectiveness

For this alternative, the MGP-related impacts to groundwater (specifically BTEX and PAHs) would not be addressed through active treatment. However, if COC concentrations are reduced via natural processes, the process is permanent and the RAO for improving groundwater quality where impacted by MGP operations and achieving groundwater standards to the extent practicable, may be met over an extended period of time. If combined with an impacted soil removal alternative, the effectiveness of this alternative would be enhanced.

It is anticipated that institutional controls would reduce potential human exposures. This alternative could meet the groundwater RAOs over time, and is considered to have an acceptable long-term effectiveness.

5.3.2.2.4 Reduction of Toxicity, Mobility, or Volume

For Alternative GW2, the toxicity, mobility and volume of impacted groundwater would likely be reduced via natural attenuating mechanisms. As presented in Section 1.5, preliminary evaluation of the MNA of dissolved BTEX and PAHs supports the general conclusion that natural attention and biodegradation processes are active and, at a minimum, have been effective components in controlling downgradient migration of the edge of the dissolved plume (i.e., stabilizing plume migration). In addition, the effectiveness of this groundwater alternative would likely be augmented by the implementation of an active MGP-impacted material removal alternative. Alternative GW2 is considered effective, and potentially would achieve the RAOs for groundwater over a period of time.

5.3.2.2.5 Implementability

This alternative is technically and administratively implementable. Monitoring wells for the collection of groundwater samples can be easily installed. Equipment and qualified personnel are readily available as are analytical laboratories to perform the chemical analyses of the groundwater samples. Implementation of institutional controls is administratively feasible but would require the approval of the current property owner(s).

5.3.2.2.6 Compliance with SCGs

Chemical-Specific SCGs

Chemical-specific SCGs that potentially apply to this alternative are associated with site groundwater and are identified in Table 2-1. Even though groundwater in the vicinity of the site is not used as a drinking water source, these SCGs include the New York Groundwater Quality Standards and other guidelines that identify acceptable chemical constituent concentrations in groundwater. Depending on the presence and effectiveness of the natural attenuation mechanisms in groundwater, this alternative could potentially meet the requirements of this SCG over time.

Action-Specific SCGs

Action-specific SCGs that potentially apply to this alternative are associated with monitoring well installation activities and periodic groundwater monitoring, specifically the handling, transportation, and disposal of waste material (i.e., spoils generated during well installation activities, purge water) and adherence to OSHA health and safety requirements would be part of this activity.

Because MGP-impacted material typically only exhibits the hazardous characteristic of toxicity for benzene (D018), it is conditionally exempt from the hazardous waste management requirements (6 NYCRR Parts 370-374 and 376) when destined for thermal treatment in accordance with NYSDEC's TAGM 4061 (NYSDEC, 2002). Compliance with the USDOT and New York State rules for the transport of hazardous materials provided in 49 CFR Parts 107 and 171.1 through 172.558 and 6 NYCRR 372.3 would be maintained. This alternative would also comply with applicable requirements outlined under OSHA, including, but not limited to the general industry standards (29 CFR 1910), safety equipment and procedures to be followed during site remediation (29 CFR 1926), and recordkeeping and reporting-related regulations (29 CFR 1904).

Location-Specific SCGs

Remedial activities would be conducted in accordance with local codes and ordinances.

5.3.2.2.7 Overall Protection of Human Health and the Environment

This alternative is considered potentially effective for protection of human health and the environment. Short-term risks to the workers and the community are easily managed through PPE, engineering controls, and community monitoring programs. Dissolved COC plumes appear to be stabilized, and natural biological and degradation processes appear to be effective. Monitoring to document the reduction in toxicity, mobility, or volume of the MGP impacts would be conducted. Because of the natural processes, this alternative would be expected to achieve the RAOs for groundwater over an extended period of time. It is anticipated that institutional controls would reduce exposures to future construction or utility workers that may encounter groundwater during future construction/maintenance activities. Overall, Alternative GW2 is considered protective of human health. As with each of the groundwater alternatives, heavily MGP-impacted material would remain beneath Hancock Street and beneath the restaurant parking area resulting in a future source of impacts to groundwater; however, as presented in Section 1.5, preliminary evaluation of monitored natural attenuation of dissolved BTEX and PAHs supports the general conclusion that natural attention and biodegradation processes are acting at the site and, at minimum, have been effective components in controlling downgradient migration of the edge of the dissolved plume. Therefore, Alternative GW2 is also considered protective of the environment.

5.3.2.2.8 Cost

The estimated costs associated with this alternative, including assumptions made in developing this cost estimate and a detailed breakdown of the estimated costs, are presented in Table 5-7. The total estimated 30-year present worth cost for implementing this alternative is approximately $620,000. The total capital costs associated with implementation of this alternative are approximately $80,000. Annual present worth O&M costs are estimated to be $270,000 for the first five years, and $278,000 for years 6 through 30 (total 30-year present worth cost of annual O&M is estimated to be approximately $548,000).

5.3.2.3 Alternative GW3 – Enhanced Natural Degradation

5.3.2.3.1 Technical Description

Similar to Alternative GW2, concentrations of dissolved MGP-related COCs in groundwater would be monitored to document natural attenuation and decreasing trends in concentrations. However, under Alternative GW3, natural degradation would be enhanced by stimulating the indigenous bacteria using an oxygen delivery system. Under most conditions, natural aerobic (or moderately anaerobic) biodegradation of BTEX and some PAHs will occur given the appropriate physiochemical conditions that support the heterotrophic bacterial community. By adding oxygen and/or other amendments (i.e., nutrients) to the groundwater via vertical application wells, the degradation of these hydrocarbons may be enhanced.

An oxygen release compound would be utilized to deliver oxygen to the groundwater through the use of application wells. If combined with a soil removal alternative, a period of monitoring (5 years) would be required to characterize post-excavation groundwater conditions. Following this monitoring period, the groundwater data would be evaluated, and bench scale and field pilot testing would be conducted to design and install an appropriate well system for the application of an oxygen releasing system, if needed. For the purposes of this Feasibility Study Report, it is estimated that a total of approximately 13 application wells would be installed across the site; approximately four on the former MGP property and approximately nine located east of Hancock Street. The wells would consist of 4-inch-diameter, Schedule 40 polyvinyl chloride (PVC) riser equipped with a approximately 10-foot long, 4-inch-diameter, Schedule 40 PVC, 90-slot (0.090-inch) PVC well screen. It is anticipated that the application wells would be screened from a depth of approximately 2 feet below the annual high water table elevation to the bottom of the well. Each application well would be finished using a flush-mounted concrete surface pad (12-inch-diameter minimum) and a 2-foot bentonite seal beneath the pad. Appropriately sized sand pack would be used to fill the annular space surrounding the well screen. The approximate locations of the application wells are shown on Figure 5-5; the quantity, configuration, locations, spacing, and depths of the application wells are subject to change and would be determined during the Remedial Design.

Following well installation, canisters containing oxygen release compound would be installed in the application wells. At pre-determined intervals, additional oxygen release compound would be added to the canisters. For the purposes of this Feasibility Study Report, and based on preliminary vendor-supplied information, it is assumed that oxygen-release compound would require changing every four months.

A groundwater monitoring program would be conducted to monitor dissolved BTEX and PAHs in groundwater along with identified geochemical parameters. For the purposes of this Feasibility Study Report, it was assumed that sampling of the groundwater for laboratory analysis would be conducted semi-annually for a five year period to document natural attenuation and geochemical conditions, and would be conducted using approximately eight monitoring wells (MW-2, MW-3, MW-4, MW-5alt, MW-7, MW-8, MW-9 and MW-10). Monitoring wells previously lost (MW-5alt) or abandoned/lost during excavation activities would be reinstalled. Additionally, the well installed within the southern gas holder would be periodically gauged for NAPL. Accumulated NAPL would be removed.

The results of the groundwater monitoring would be summarized and presented to NYSDEC in annual reports. After a five year period of application of the oxygen releasing material (i.e., 10 years after a soil removal component is completed, if required), an evaluation of the long-term monitoring and oxygen-enhancement application wells would be conducted and presented to the NYSDEC. Based on the analytical results and trends in groundwater COC concentrations, National Grid may propose modifications to the monitoring program. For the purposes of this Feasibility Study Report, it is assumed that annual sampling to document MNA and enhanced oxygenation would be conducted for an additional 20 years (i.e., for a total of 30 years).

In addition, institutional controls would be implemented to limit the use of groundwater containing COCs above NYSDEC Class GA standards and guidance values. National Grid would work with the NYSDEC and the current property owner(s) to implement institutional controls in the form of governmental, enforcement, and/or permit controls that would limit disturbance of the groundwater monitoring network and restrict groundwater use and/or groundwater extraction within the site.

5.3.2.3.2 Short-Term Effectiveness

Implementation of Alternative GW3 could result in the exposure of site workers to MGP impacts during application well installation and groundwater sampling activities. Potential exposure mechanisms would include ingestion or dermal contact with impacted soil and/or groundwater (or removed NAPL [if any]), and inhalation of volatized organic vapors. Potential exposure of workers to MGP impacts would be mitigated by the use of PPE and real-time monitoring, as specified in a site-specific HASP.

There would be minimal increased risks to the community as a result of implementation of this alternative (e.g., dust during installation activities); however, monitoring and engineering controls could easily be implemented to mitigate these potential risks. Therefore, no significant short-term impacts to health would be anticipated during implementation of this alternative. Alternative GW3 therefore meets the short-term effectiveness criterion.

5.3.2.3.3 Long-Term Effectiveness

For this alternative, the MGP-related impacts to groundwater (specifically BTEX and PAHs) would be addressed by enhancing the natural degradation processes by the addition of oxygen and/or nutrients and by documenting the natural attenuation mechanisms. This alternative is considered effective on a long-term basis as dissolved MGP impacts would be attenuated over time. Long-term monitoring of the effectiveness of this alternative would be conducted to document that it is effective. It is anticipated that institutional controls would reduce potential human exposures. This alternative could potentially meet the groundwater RAOs over an extended period of time, and is considered to be effective over the long-term.

5.3.2.3.4 Reduction of Toxicity, Mobility, or Volume

Similar to Alternative GW2, Alternative GW3 would likely reduce the toxicity, mobility and volume of impacted groundwater via natural attenuating mechanisms enhanced by oxygen and/or other augments (i.e., nutrients). Existing groundwater data indicate that natural attenuation and biodegradation processes are active and, at a minimum, have been effective in controlling downgradient migration of the edge of the dissolved plume. In addition, the effectiveness of this groundwater alternative would likely be augmented by the implementation of an active soil removal alternative. Although groundwater in the vicinity of the site is not used as a drinking water source, it is anticipated that institutional controls would further reduce potential human exposures. Overall, Alternative GW3 is considered effective on a long-term basis, and would achieve the RAOs for groundwater over time.

5.3.2.3.5 Implementability

This alternative is technically and administratively implementable. Equipment and materials for the installation of the oxygen delivery system, application wells and monitoring wells is readily available and can be easily installed. Equipment and qualified personnel are readily available as are analytical laboratories to perform the required analyses of the groundwater samples. Implementation of institutional controls is administratively feasible but would require the approval of the current property owner(s). Installation of the application wells and continued operation and maintenance would also require permission from the current property owner(s).

Long-term operation of the application wells located east of Hancock Street may cause issues. Several wells, including the former monitoring wells MW-1, MW-5, MW-5alt, and MW-6 have been lost, primarily because National Grid does not own or operate the properties. The parking area east of Hancock Street is covered by either stone, gravel, or asphalt maintained in varying states of repair. Snow removal (especially in uneven, unpaved areas), grading, and high traffic in the proposed application well areas would require significant maintenance/repair in the long-term.

5.3.2.3.6 Compliance with SCGs

Chemical-Specific SCGs

Chemical-specific SCGs that potentially apply to this alternative are associated with site groundwater and are identified in Table 2-1. Even though groundwater in the vicinity of the site is not used as a potable water source, these SCGs include the New York Groundwater Quality Standards and other guidelines that identify acceptable chemical constituent concentrations in drinking water. Depending on the effectiveness of the natural attenuation mechanisms in groundwater, and the ability of the oxygen delivery system to enhance those mechanisms, this alternative could potentially meet the requirements of this SCG over time.

Action-Specific SCGs

Action-specific SCGs that potentially apply to this alternative are associated with application well installation activities and disposal of waste material (i.e., spoils generated during well installation activities) and adherence to OSHA health and safety requirements would be part of this activity.

Because MGP-impacted material typically only exhibits the hazardous characteristic of toxicity for benzene (D018), it is conditionally exempt from the hazardous waste management requirements (6 NYCRR Parts 370-374 and 376) when destined for thermal treatment in accordance with NYSDEC's TAGM 4061 (NYSDEC, 2002). MGP-impacted waste material may potentially be generated as a result of well installation activities. Compliance with the USDOT and New York State rules for the transport of hazardous materials provided in 49 CFR Parts 107 and 171.1 through 172.558 and 6 NYCRR 372.3 would be maintained. This alternative would also comply with applicable requirements outlined under OSHA, including, but not limited to the general industry standards (29 CFR 1910), safety equipment and procedures to be followed during site remediation (29 CFR 1926), and recordkeeping and reporting-related regulations (29 CFR 1904).

Additionally, Underground Injection Control (UIC) notifications, as required by the USEPA (40 CFR 144), would be required as part of this alternative. For remediation projects where the NYSDEC provides oversight, the USEPA typically only requires a letter containing enough detail to understand the process and where the injection is taking place to provide an "authorization by rule."

<u>Location-Specific SCGs</u>

Remedial activities would be conducted in accordance with local codes and ordinances.

5.3.2.3.7 Overall Protection of Human Health and the Environment

Short-term risks to the workers and the community are easily managed through PPE, engineering controls, and community monitoring programs. NAPL, if existing, appears to be immobile and the dissolved plume is stabilized, and natural biological and degradation processes appear to be effective. Use of an oxygen delivery system to enhance the natural degradation processes and monitoring to document the reduction in toxicity, mobility, or volume of the MGP impacts would be conducted. Because of the enhanced natural processes, this alternative would be expected to achieve the RAOs for groundwater over an extended period of time. It is anticipated that institutional controls would reduce potential exposures to future construction or utility workers that may encounter groundwater during the future construction/maintenance activities. Overall, Alternative GW3 is considered protective of human health and the environment. As with each of the groundwater alternatives, heavily MGP-impacted material would remain beneath Hancock Street and beneath the restaurant parking area resulting in a future source of impacts to groundwater; however, as presented in Section 1.5, preliminary evaluation of MNA of dissolved BTEX and PAHs supports the general conclusion that natural attention and biodegradation processes are active and, at minimum, have been effective in controlling downgradient migration of the edge of the dissolved plume. Therefore, Alternative GW3 is also considered protective of the environment.

5.3.2.3.8 Cost

The estimated costs associated with this alternative, including assumptions made in developing this cost estimate and a detailed breakdown of the estimated costs, are presented in Table 5-8. The total estimated 30-year present worth cost for implementing this alternative is approximately $1,520,000. The total capital costs associated with implementation of this alternative are approximately $550,000. Total annual O&M present worth costs are estimated to be $285,000 for the first five years, and $678,000 for years 6 through 30 (total 30-year present worth cost of annual O&M is estimated to be $963,000).

6. Comparative Analysis of Alternatives

6.1 General

This section presents the comparative analysis of each remedial alternative using the seven evaluation criteria identified in Section 5.2. The comparative analysis identifies the advantages and disadvantages of each alternative relative to each other and with respect to the seven criteria. The results of the comparative analysis were used as a basis for recommending remedial alternatives for addressing the RAOs identified for the site.

6.2 Comparative Analysis for Subsurface Soil Alternatives

This section provides a comparative analysis of the four subsurface soil alternatives with respect to the seven evaluation criteria identified in Section 5.2. For reference throughout this section, the alternatives are summarized below:

- Alternative SM1 – No Further Action
- Alternative SM2 – Remove Contents of Northern Gas Holder
- Alternative SM3 – Remove Northern Gas Holder and MGP-Impacted Material Above Confining Layer on Former MGP Property
- Alternative SM4 – Remove Northern Gas Holder and Soil Above 6NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use

Because Alternative SM5 is not technically feasible and, therefore; did not require detailed evaluation in Section 5 it is not included in the comparative analysis evaluation in Section 6. However, a cost estimate is included in Section 6.2.7 for comparison purposes.

6.2.1 Short-Term Effectiveness

The short-term effectiveness comparison includes the evaluation of potential community and environmental impacts and site worker exposures during implementation of the alternative, the effectiveness of measures to be used to mitigate those short-term impacts, and the relative time frame for implementation.

Alternative SM1 does not include the implementation of active remedial measures; therefore there are no potential short-term effects to the community or environment associated with this alternative. No direct sources of greenhouse gas emissions (e.g., on site combustion of fuels) are associated with this alternative.

Alternatives SM2, SM3, and SM4 all include the excavation, off-site transportation, and treatment/disposal of increasing volumes of MGP-impacted material from the subsurface, and; therefore, would result in short-term exposures to site workers and the community. Short-term impacts to the community include operation large construction equipment, noise, dust, increased vehicular traffic, temporary closure of Hancock Street, and re-routing of traffic around the project area. Potential exposures would be mitigated, to the extent practicable, by use of PPE, air monitoring, proper planning, and implementation of engineering controls. The duration of short-term impacts, including site preparation, mobilization, installation/removal of temporary sheet pile, and excavation would be approximately two months for Alternative SM2, approximately four months for Alternative SM3, and approximately seven months for Alternative SM4. In addition, it is anticipated that, due to safety concerns, the restaurant could not operate during implementation of portions of Alternative SM4. Alternative SM2 would have the least short-term impact to the community, followed by Alternative SM3, while Alternative SM4 would have significantly greater short-term impacts.

In addition, due to the increased time required for implementation, the relative carbon footprint associated with SM4 would be significantly larger than for Alternative SM2 and SM3.

6.2.2 Long-Term Effectiveness

Long-term effectiveness includes an evaluation of the risk remaining at the site after the remedial objectives have been met, and the effectiveness of the controls that would be applied to manage risks (if any) posed by untreated residuals (USEPA, 1988).

Alternative SM2, SM3, and SM4 are considered effective on a long-term basis. Each of the alternatives, except Alternative SM1, would provide some measure of permanent reduction of MGP-impacted material at the site; therefore, resulting in a reduction of impacts to the environment. However, as presented in Section 3.2, the HHEA concluded that under current use and daily operations, there are no existing exposure routes to subsurface soil or groundwater. Although Alternative SM4 includes removal of the largest volume of MGP-impacted soil, it still leaves some MGP-impacted material in place (e.g., beneath Hancock Street). Therefore, Alternative SM4 does not provide a significantly higher long-term effectiveness. Because some amount of MGP-impacted material would remain at the conclusion of the excavation activities, all alternatives include some form of institutional controls that would mitigate, to the extent practicable, potential human health exposure to remaining COCs. Periodic reports would be filed with the NYSDEC to demonstrate that the institutional controls and surface cover for each alternative are being maintained. Therefore, because the risks remaining at the site and the effectiveness of the controls are similar, the long-term effectiveness of Alternative SM2, SM3, and SM4 are considered equivalent.

6.2.3 Reduction of Toxicity, Mobility, or Volume

The comparative evaluation of the reduction in toxicity, mobility, or volume focuses on the ability of the treatment processes to address the impacted material; the mass of material destroyed or treated the irreversibility of the process employed, and the nature of remaining residuals at the site.

Alternative SM1 would not actively treat, remove, recycle, or destroy MGP-impacts; therefore, the toxicity, mobility, or volume of MGP-impacted material would only be reduced by natural attenuation processes over a long period of time. However, monitoring would not be conducted to document the reduction. Alternative SM1 is considered the least effective for this criterion. Alternative SM4 was developed to provide a remedial alternative with the objective of achieving, to the extent practicable, 6NYCRR Part 375 commercial criteria for the site, and therefore, represents the most effective alternative for this criterion.

Alternatives SM2 and SM3 would remove approximately 450 cy and 720 cy of heavily MGP-impacted material from the former MGP property, respectively. Alternative SM4 would remove a total of approximately 1,500 cy of heavily MGP-impacted material and subsurface soil containing COCs above 6 NYCRR Part 375 commercial criteria from the site; however, with a significantly larger effort (approximately 4,600 cy of material would be excavated over a significantly longer period of time).

6.2.4 Implementability

Each of the alternatives requires the implementation of institutional controls. For each alternative, institutional controls are considered both technically and administratively implementable. Technically, Alternative SM1 would be the most implementable alternative because it requires no active remedial site work.

Alternative SM2 and SM3 are considered implementable; however, some technical and administrative difficulties exist, primarily including site constraints, topography, diversion of vehicular and pedestrian traffic, and overhead obstructions. Alternative SM2 is more implementable than Alternative SM3 because of potential space limitations and obstructions associated with the increased amount of sheet pile that would require installation with Alternative SM3.

Alternative SM4 is considered significantly less implementable due to similar difficulties; however, due to the larger excavation area, the magnitude of these difficulties is increased. In addition, excavation to deeper depths (approximately 24 feet bgs in some areas) in limited space creates potential sheet pile design difficulties (e.g., limited space for external tie-backs). Also, due to the proximity of at least one of the excavation cells to the restaurant, and associated safety and noise concerns, the restaurant would be closed during a portion of the sheet pile installation/removal and excavation activities. As previously stated, according to the former historian for the Village of Fort Plain, the walls of the former Erie Canal exist today and are constructed of limestone blocks. As presented in Section 1.4, the former canal was filled with rip-rap, fill dirt, and other materials (e.g., wood). Excavation and removal of the former canal structure and contents is not considered feasible. Lastly, closure of Hancock Street would be required for a portion of the active duration of the construction/excavation activities, which are estimated to require a total of 6 months over two construction seasons.

6.2.5 Compliance with SCGs

Chemical-Specific SCGs

Alternative SM1 does not involve active removal, treatment, or containment of MGP-impacted material; therefore, chemical-specific SCGs would only be achieved after long-term natural attenuation processes had reduced COCs to meet the criteria identified in Table 2-1.

Neither Alternatives SM2, SM3, nor Alternative SM4 alone would immediately achieve compliance with SCGs in all media. Each of these alternatives would remove increasing amounts of MGP-impacted material (and NAPL if encountered) that represent the greatest MGP impacts to the site; however, MGP-impacted material would remain after each of the excavation alternatives were implemented. Therefore, chemical-specific SCGs would only be achieved for each of the soil alternatives after long-term natural degradation processes had reduced COCs to meet the criteria identified in Table 2-1.

For Alternatives SM2, SM3, and SM4 that require excavation, material handling would be performed in a manner that complies with the applicable chemical-specific SCGs listed in Table 2-1, including LDRs, USTs, and the NYSDEC's *Guidance on the Management of*

Coal Tar Waste and Coal Tar Contaminated Soils and Sediment form Former Manufactured Gas Plants.

Action-Specific SCGs

Because Alternative SM1 does not involve implementation of active removal, treatment, or containment remedial actions for subsurface MGP-impacted material, action-specific SCGs identified in Table 2-2 are not applicable. For Alternatives SM2, SM3, and SM4, health and safety related SCGs would be addressed by following a site-specific HASP during remedy implementation. In addition, appropriate procedures would be followed to comply with SCGs related to the handling and disposal of hazardous waste (including transportation and disposal, permitting, manifesting, disposal and treatment facilities). Action-specific SCGs would be achieved for each of the alternatives.

Location-Specific SCGs

Because Alternative SM1 does not involve implementation of active removal, treatment, or containment remedial actions for MGP-impacted subsurface material, location-specific SCGs identified in Table 2-3 are not applicable. For Alternatives SM2, SM3, and SM4, potentially applicable location-specific SCGs include the acquisition of regulatory approvals/permits (including local building permits). The requirements of these approvals/permits would be met during the design and implementation phases of these alternatives.

6.2.6 Overall Protection of Human Health and the Environment

For Alternative SM1, the implementation of institutional controls would minimize the potential for human exposure to subsurface COCs, but would not provide adequate protection of the environment because the existing volume of MGP-impacted material would remain without treatment or containment. Additionally, Alternative SM1 would not achieve compliance with NYSDEC SCGs within a foreseeable time period, and documentation of naturally occurring degradation processes would not be conducted.

Alternatives SM2, SM3, and SM4 would each achieve the RAOs for protecting human health and the environment. In addition to removal of MGP-impacted material, institutional controls would minimize the potential for human exposure to subsurface COCs that remain.

As stated in Section 5.3.1.4.7, the HHEA conducted that there are no existing exposure routes to subsurface soil. Alternative SM2 would remove approximately 450 cy of subsurface MGP-impacted material, and Alternative SM3 would remove approximately 720 cy of MGP-impacted material from the former MGP property (approximately 60% greater volume). However, although Alternative SM3 includes removal of the larger volume of MGP-impacted soil, it still leaves impacted material in place (e.g., beneath Hancock Street and the parking area east of Hancock Street); therefore, Alternatives SM2 and SM3 would provide similar protection of human health. Alternative SM3 would provide an incrementally increased protection of the environment due to the larger volume of MGP-impacted material removed; however, both alternatives would result in reduced impacts to groundwater from MGP-related COCs. Both of these alternatives would achieve the RAOs for soil for the site.

While Alternative SM4 represents the removal of the largest volume of MGP-impacted material, it does not effectively increase the overall protection of human health and the environment, or reduce risks remaining after the remediation objectives have been met. Alternative SM4 represents significantly greater short-term impacts, exposures, and disruptions to the community over a longer period of time than Alternatives SM2 and SM3. The ability to re-route traffic around Hancock Street for an extended period of time would present significant difficulties. The HHEA concluded that there are no existing exposure routes to subsurface soil or to groundwater, and although Alternative SM4 includes removal of the largest volume of MGP-impacted soil, it still leaves some MGP-impacted material in place. Therefore, Alternative SM4 does not provide a significantly greater protection to human health; institutional controls would still be required. Alternative SM4 also represents a significantly higher contribution to greenhouse gases than Alternatives SM2 and SM3, statistically greater probability of accidents occurring during the extended duration of the project, overall higher nuisance to the community (including noise, traffic disruption, impacts to the restaurant, etc.), and wear on Hancock and State streets. Overall, Alternative SM4 would also achieve the RAOs for the site.

6.2.7 Cost

The following table summarizes the estimated costs associated with each of the four subsurface soil remedial alternatives.

Alternative	Estimated Capital Cost (rounded)	Estimated Present Worth O&M Cost (rounded)	Estimated Total Cost (rounded)
SM1	$70,000	$120,000	$190,000
SM2	$1,290,000	$120,000	$1,410,000
SM3	$2,400,000	$120,000	$2,520,000
SM4	$7,600,000	$120,000	$7,710,000
SM5	$6,720,000*	$120,000	$6,850,000*

* Cost provided is only associated with removal of the northern and southern gas holders and soil containing constituents exceeding their respective 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives for the onsite portion of the site. It is not feasible to provide a cost estimate to dismantle and relocate the electrical substation at this time due to unknown siting, permitting, temporary electrical supply, regulatory, and other issues that are not within the scope of this feasibility study. These unknown costs are expected to significantly increase the cost of Alternative SM5.

As indicated in the table above, total costs associated with implementing Alternative SM1 are the lowest, followed by (in order from lowest to highest) SM2, SM3, and SM4 (cost for SM5 is a partial cost).

6.3 Comparative Analysis of Groundwater Remedial Alternatives

This section provides a comparative analysis of the three groundwater alternatives with respect to the seven evaluation criteria identified in Section 5.2. For reference throughout this section, the three groundwater alternatives are summarized as follows:

- Alternative GW1 – No Further Action
- Alternative GW2 – Monitored Natural Attenuation
- Alternative GW3 – Enhanced Natural Degradation

6.3.1 Short-Term Effectiveness

Alternative GW1 does not involve the implementation of active remedial measures; therefore, there are no potential short-term effects to the community or environment associated with this alternative. There would be minimal increased risks to site workers and the community as a result of the implementation of Alternative GW2. Monitoring, PPE, and engineering controls could easily be implemented to mitigate these exposures.

Similarly, the potential short-term effects to site workers and the community as a result of implementing Alternative GW3 during installation of monitoring wells and/or performance wells would be increased. These increased short-term effects are also considered minimal and easily mitigated through the use of monitoring, PPE, and engineering controls. The short-term effectiveness of the three groundwater alternatives is generally considered comparable and easily manageable.

6.3.2 Long-Term Effectiveness

All three groundwater alternatives include implementation of institutional controls to reduce potential human exposures. Alternative GW1 is considered only moderately effective on a long-term basis because it does not monitor/document natural attenuation processes or groundwater conditions over time. Alternative GW2 includes periodic groundwater monitoring to document the natural attenuation mechanisms, and is considered effective on a long-term basis. Alternative GW3 involves enhancing the natural degradation processes in the subsurface through the addition of oxygen, and includes periodic monitoring of groundwater to document conditions through time. However, if heavily MGP-impacted material remains downgradient of the application wells after the subsurface soil remedy is implemented, the long-term effectiveness of Alternatives GW2 and GW3 are similar. This is because of the high oxygen demand of the MGP-impacted material would likely exceed the ability to increase the dissolved oxygen content of the groundwater over a sufficient area to create a measurable difference in the duration required for groundwater treatment. Both Alternatives GW2 and GW3 include periodic groundwater monitoring to document the natural attenuation mechanisms, and are considered effective on a long-term basis when combined with the removal of MGP-impacted material.

6.3.3 Reduction in Toxicity, Mobility, and Volume

For Alternative GW1, COCs in groundwater would not be contained, removed or actively treated. Therefore, the toxicity, mobility, and volume of chemical constituents present in groundwater would not be reduced, except by long-term natural processes. Preliminary evaluation indicates natural attenuation processes are occurring at the site; however, the reduction in toxicity, mobility, or volume of the MGP impacts would not be monitored and/or documented as part of this alternative. Therefore, this Alternative GW1 is not considered effective for this criterion.

Alternative GW2 includes the monitoring of natural attenuating mechanisms and degradation of COCs. Alternative GW3 would potentially enhance the rate of natural degradation of the dissolved constituents via addition of an oxygen release compound, and is considered the most effective alternative for this criterion if all heavily MGP-impacted material is removed from the site. However, for each of the retained soil alternatives, heavily MGP-impacted material would exist on the site after excavation/removal activities are completed. As presented above, natural attenuation has been effective at the site under current conditions. The dissolved plume migration has stabilized, dissolved concentrations of BTEX and PAHs in groundwater decrease to non-detectable levels immediately outside the areas containing heavy MGP impacts (monitoring wells MW-3, MW-8, and MW-9), and no exposure to groundwater exists. Additionally, the geochemical data collected during the July 2007 groundwater sampling event indicates that Iron III Reduction and Sulfate Reduction (anaerobic degradation) are the primary processes in groundwater in areas where higher concentrations of BTEX and PAHs were present (aerobic or mildly reducing conditions were present in groundwater collected from wells around the perimeter of the dissolved plume). Addition of oxygen (Alternative GW3) would act as an electron acceptor and, therefore, may increase the bacteria's overall ability to metabolize dissolved volatile compounds; however, bench-scale and/or pilot testing would be required to determine the quantity of oxygen required to overcome the oxygen demand of the subsurface to create aerobic conditions. Additionally, the consumption of oxygen introduced into the groundwater would be anticipated to occur rapidly and within a short distance downgradient from the application well. Constituents from the impacted soil downgradient from the application wells would continue to dissolve into the groundwater. For these reasons, when comparing Alternatives GW2 and GW3, the incremental net benefit for GW3 would be minimal for reduction of the toxicity, mobility of impacts within the area containing soil impacts; however GW3 may increase the rate of biodegradation and; therefore, reduce a larger volume of impacts. Alternative GW3; however, would not shorten the required remediation time when compared to Alternative GW2.

6.3.4 Implementability

All three alternatives are considered both technically and administratively implementable. Material, equipment, and personnel required to implement Alternatives GW2 and GW3 are readily available. Alternative GW3 would require installation of application wells within the parking area and in front of the entrance to the restaurant located east of Hancock Street. Equipment and qualified personnel are readily available as are analytical laboratories to perform chemical analyses of groundwater samples. Permission from the owner(s) of the properties to install, operate, and maintain the monitoring and application wells would be required. However, long-term operation of the application wells located east of Hancock Street may cause maintenance issues. Several wells, including the former wells MW-5, MW-5alt, and MW-6 have been lost, primarily because National Grid does not own or operate the properties. The parking area east of Hancock Street is covered by either stone, gravel, or asphalt maintained in varying states of repair. Snow removal (especially in uneven, unpaved areas), grading, and high traffic in the area of the proposed application well would require high maintenance/repair in the long-term.

6.3.5 Compliance with SCGs

Chemical-Specific SCGs

For all three alternatives, the applicable SCGs identified in Table 2-1 would not be achieved until natural processes had reduced COCs. However, Alternatives GW2 and GW3 include periodic monitoring to document natural attenuation, and Alternative GW3 also includes enhancing the groundwater's natural attenuation processes. While Alternative GW3 may provide an incremental benefit in the reduction of dissolved MGP-related COCs, impacted soil will remain beneath both Hancock Street and the parking area downgradient from the application wells. MGP-related COCs will continue to dissolve from these impacted soils. Pilot testing has not been conducted to estimate dispersion, consumption, or dilution of dissolved oxygen; however, it is believed that the oxygen will be consumed rapidly within a short distance from the application well. Therefore, Alternative GW-3 is not anticipated to provide a measurable/significant increase in ability to achieve the chemical-specific SCGs within the dissolved plume.

Action-Specific SCGs

Because Alternative GW1 does not include the implementation of any active remedial activities, the action-specific SCGs identified in Table 2-2 are not applicable. Action-specific SCGs that potentially apply to Alternatives GW2 and GW3 are associated with well installation activities, installation of application wells and monitoring wells, and periodic NAPL removal (if existing), specifically the handling, transportation, and disposal of waste material (e.g., spoils generated during well installation activities) and adherence to OSHA health and safety requirements would be part of these activities. As indicated previously, application to the USEPA for "authorization by rule", as required by the USEPA (40 CFR 144), would be required as part of this alternative. Both Alternatives GW2 and GW3 are considered equally effective at achieving action-specific SCGs.

Location-Specific SCGs

Alternative GW1 does not include the implementation of active remedial actions; therefore, the location-specific SCGs are not applicable. Location-specific SCGs that are potentially applicable to Alternative GW2 and GW3 may involve securing local permits in conjunction with monitoring well and/or application well installation. Both alternatives would comply with location-specific SCGs, and are considered equally effective at achieving this criterion.

6.3.6 Overall Protection of Human Health and the Environment

As presented in Section 1.5, preliminary evaluation of monitored natural attenuation of the dissolved BTEX and PAHs plume supports the general conclusion that natural attenuation and biodegradation processes are active and, at a minimum, have been effective in controlling downgradient migration of the edge of the dissolved plume (i.e., stabilizing plume migration). Each of the groundwater alternatives would include institutional controls that would reduce potential exposures, and are considered effective for protection of human health. Short-term and long-term risks to site workers, utility workers, and the community are easily managed through monitoring, PPE, and engineering controls.

Alternatives GW2 and GW3 include the periodic monitoring to document natural attenuation, and Alternative GW3 also includes enhancing the groundwater's natural attenuation processes; therefore, they are considered more effective for overall protection of human health and the environment than GW1. Alternatives GW2 and GW3 are considered equally protective of human heath. While Alternative GW3 may provide an incremental benefit in the reduction of dissolved BTEX and PAHs, impacted soil will remain beneath both Hancock Street and the parking area downgradient from the Alternative GW3 oxidant applications wells. It is believed that the oxygen will be consumed rapidly within a short distance from the application wells; therefore, Alternative GW3 provides a slight increase in the overall protection of the environment.

6.3.7 Cost

The following table summarizes the estimated costs associated with each of the three groundwater remedial alternatives.

Alternative	Estimated Capital Cost (rounded)	Estimated Present Worth O&M Cost (rounded)	Estimated Total Cost (rounded)
GW1	$ 60,000	$ 80,000	$ 140,000
GW2	$ 75,000	$ 548,000	$ 620,000
GW3	$ 550,000	$ 965,000	$ 1,520,000

As indicated in the table above, total costs associated with implementing Alternative GW1 are the lowest, followed by (in order from lowest to highest) Alternatives GW2 and GW3.

7. Recommendation of Preferred Alternatives

Evaluation of the remedial alternatives for remediation of subsurface soil and groundwater at the site was completed in accordance with the procedures outlined in NYSDEC TAGM 4030 as well as USEPA guidance for the completion of feasibility studies in accordance with CERCLA and the NCP.

Based on the comparative analysis, the preferred remedial alternatives are presented below.

7.1 Subsurface Soil

Based on the comparative analysis of the four subsurface soil alternatives presented in Section 6, Alternative SM3 is as the preferred remedial alternative. Alternative SM3 would cost-effectively achieve the best balance of the seven NYSDEC evaluation criteria and would achieve the RAOs developed for this medium in a reasonable time frame. This remedy represents a permanent reduction in the toxicity, mobility, and volume of MGP-impacted material representing the greatest impacts both in the saturated and unsaturated zones by excavation and removal.

Alternative SM3, which is described in detail in Section 5.3.1.3, includes the following primary components:

- removal of the northern gas holder and its contents to eliminate potential sources of impacts to subsurface soil
- excavation and removal of heavily MGP-impacted material from the former MGP property above the silt and clay confining layer (approximately 13 to 15 feet bgs), to the extent practicable
- off-site treatment and disposal of the excavated material
- site restoration, including installing and maintaining a stone surface cover on the former MGP property to reduce, to the extent practicable, exposure to COCs
- institutional controls to reduce potential exposure to COCs remaining at the site

Additionally, Alternative SM3 is a proven technology for removal of MGP-impacted material, and is administratively implementable. Some technical difficulties exist associated with delineating the practical soil removal area due to site-specific characteristics (e.g., topography, site size, etc.) and constraints (e.g., presence of electrical substation), and associated with the design and installation of the sheetpile system. Potential short-term impacts to the community during implementation of this alternative are considered manageable; however, an evaluation of the ability to re-route traffic around Hancock Street for a four month period has not been conducted. This alternative is considered to have a high long-term effectiveness. Although the HHEA concluded that under current use there are no exposure routes to subsurface soil, Alternative SM3 would further reduce potential exposure associated with MGP-impacted subsurface soil. In addition, when combined with the recommended groundwater alternative (Alternative GW3), Alternative SM3 achieves the RAOs identified for the site.

Alternative SM3 is recommended rather than Alternatives SM2 and SM4 because it:

- removes approximately 80 percent of the heavily MGP-impacted material from the former MGP property (versus 50 percent for Alternative SM2) and includes the addition of an oxygen-releasing compound and/or other suitable treatment amendments (e.g., nutrients) to the backfill material that is used below the groundwater table to stimulate growth of indigenous bacteria and enhance the degradation of dissolved MGP residuals.

- requires a shorter construction schedule than SM4, and therefore, the smaller disruption to the community, including a shorter duration for the closure of Hancock Street

- represents a smaller contribution to greenhouse gases than Alternative SM4 (i.e., smaller carbon footprint)

- has a significantly higher level of implementability than Alternative SM4

- has an equivalent long-term effectiveness compared to Alternatives SM2 and SM4

- represents and equivalent overall protection to human health compared to Alternatives SM2 and SM4 (no current exposures exist to impacted soil or groundwater)

- achieves the RAOs at the most reasonable cost

Each of the soil alternatives leaves MGP-impacted soil in place and requires monitoring for an extended period of time. However, although the leading edge of the dissolved groundwater plume is not migrating, implementation of Alternative SM3 would reduce the potential for future migration of MGP-related COCs from the former MGP property.

7.2 Groundwater

Based on the comparative analysis of the three groundwater remedial alternatives presented in Section 6, Alternative GW3 is recommended as the preferred remedial alternative. This recommended remedy is an approach that would effectively address the dissolved COCs, to the extent practicable. It would achieve the best balance of the seven NYSDEC evaluation criteria and mitigate the potential for human exposure to impacted groundwater. Alternative GW3, which is described in detail in Section 5.3.2.3, includes the following primary components:

- monitor groundwater for a period of five years after the proposed soil removal action is completed through a scheduled sampling program to document groundwater conditions and the ongoing natural attenuation of dissolved COCs
- following the initial five year monitoring period, groundwater data would be evaluated, and bench-scale and field pilot testing would be conducted to design and install an appropriate well system for the application of an oxygen releasing system
- monitor the oxygen enhanced natural degradation of groundwater for a period of five years to evaluate the effectiveness of the remedy; based on the results, propose additional operation, modification, or discontinuation of the application of oxygen
- implement institutional controls that would place health and safety requirements on subsurface intrusion activities and groundwater extraction within the site

Selection of Alternative GW3 as the preferred groundwater remedial alternative is appropriate because when combined with soil Alternative SM3, it achieves the groundwater RAOs with moderate short-term and long-term impacts and implementability concerns, and documents the reduction in toxicity, mobility and volume of MPG impacts and is cost effective. As presented in Section 3.3, the RAOs for groundwater are to eliminate or reduce, to the extent practicable:

- contact with, or inhalation of MGP-related COCs in soil or groundwater
- the source of MGP-related groundwater impacts

- migration of MGP-related COCs that would result in groundwater impacts

As also presented in Section 3.3.3, groundwater at the site is not used for potable water; therefore, the greatest potential for exposure is during construction/excavation work being conducted on the former MGP property (groundwater is located at depths of 16 to 18 feet bgs east of the former MGP property). Potential exposure to groundwater (i.e., contact with, or inhalation of MGP-related COCs in soil or groundwater) on the former MGP property would be mitigated by the use of institutional controls in the form of governmental, proprietary, enforcement, or permit controls, and/or informational devices (e.g., signs, postings) would be instituted to limit future excavation and use of groundwater. Therefore, Alternative SM3 satisfies the first RAO presented above.

With respect to the second groundwater RAO (to eliminate or reduce, to the extent practicable the source of MGP-related groundwater impacts), potential future impacts to groundwater would be reduced by removal of MGP-impacted material from within the northern gas holder (eliminating future releases from the holder) and by reducing the potential for leaching of impacted material from within the unsaturated zone into the groundwater. Therefore, Alternative SM3 also achieves this RAO.

The third RAO for groundwater is to eliminate or reduce, to the extent practicable, migration of MGP-related COCs that would result in groundwater impacts. As presented in the previous paragraph, removal of the contents of the gas holder and heavily MGP-impacted soil from within the unsaturated zone would significantly decrease the potential migration of MGP-related COCs from the unsaturated zone to the groundwater. Therefore, Alternative SM3 also satisfies this RAO.

7.3 Preferred Alternative Cost Estimate

The following table summarizes the total estimated costs associated with the preferred subsurface soil and groundwater alternatives.

Alternative	Estimated Capital Cost (rounded)	Estimated Present Worth O&M Cost (rounded)	Estimated Total Cost (rounded)
GW3	$ 550,000	$ 965,000	$ 1,520,000
SM3	$ 2,400,000	$ 120,000	$ 2,520,000
Total Present Worth Cost Estimate			**$ 4,040,000**

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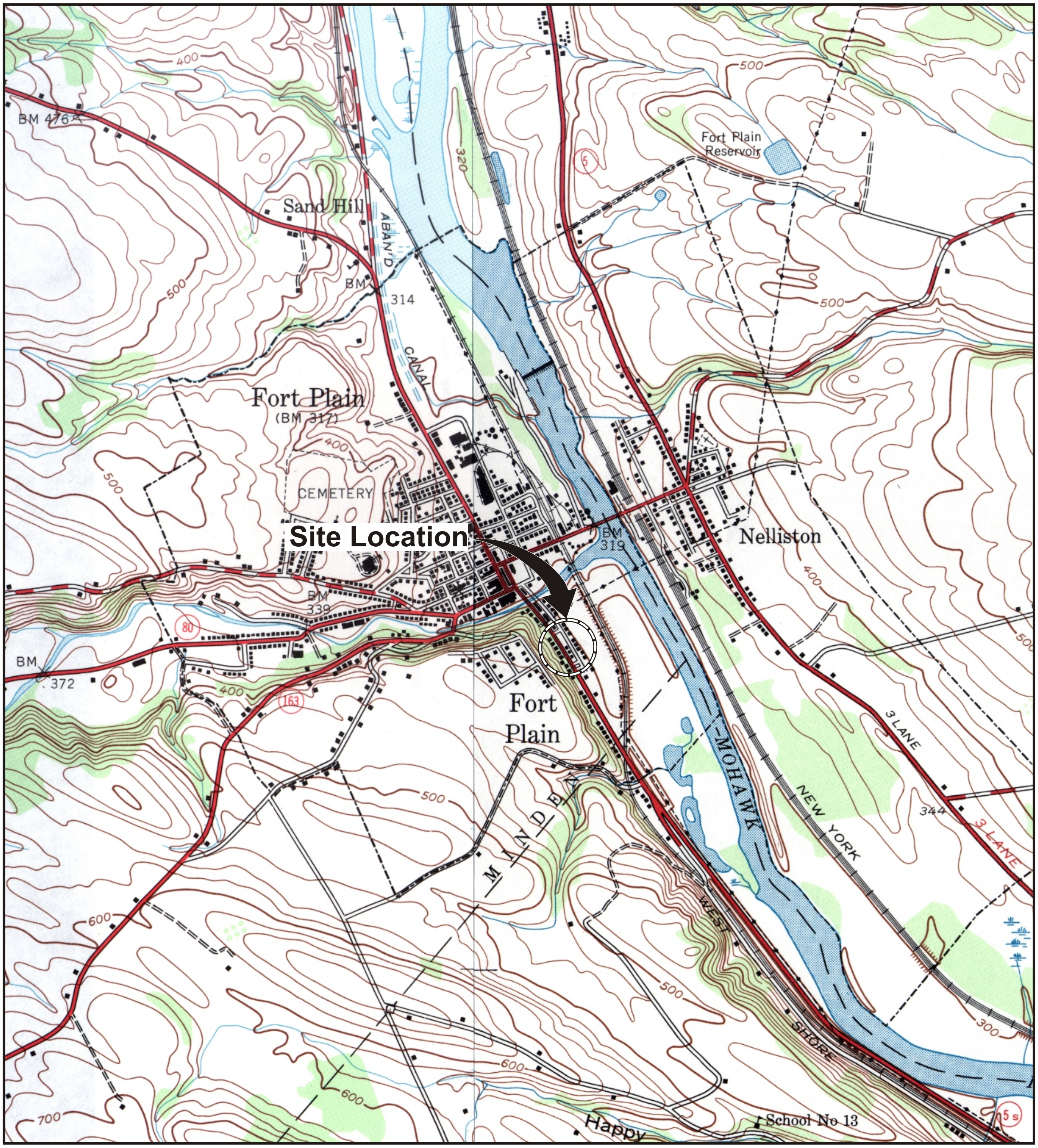
Figures



REFERENCE: BASE MAP USGS 7.5 MIN. QUADS., CANAJOHARIE, AND FORT PLAIN NY, 1944.

2000' 0 2000'

Approximate Scale: 1" = 2000'

Area Location

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE

FEASIBILITY STUDY REPORT

SITE LOCATION MAP

ARCADIS

FIGURE
1-1

8/30/07-SYR-KLS
36675004/36675N01.CDR

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

SITE PLAN

ARCADIS

FIGURE
1-2

SYR-85-TJR DMW WLJ LAYER: ON=*, OFF=REF*
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XREFS: IMAGES:
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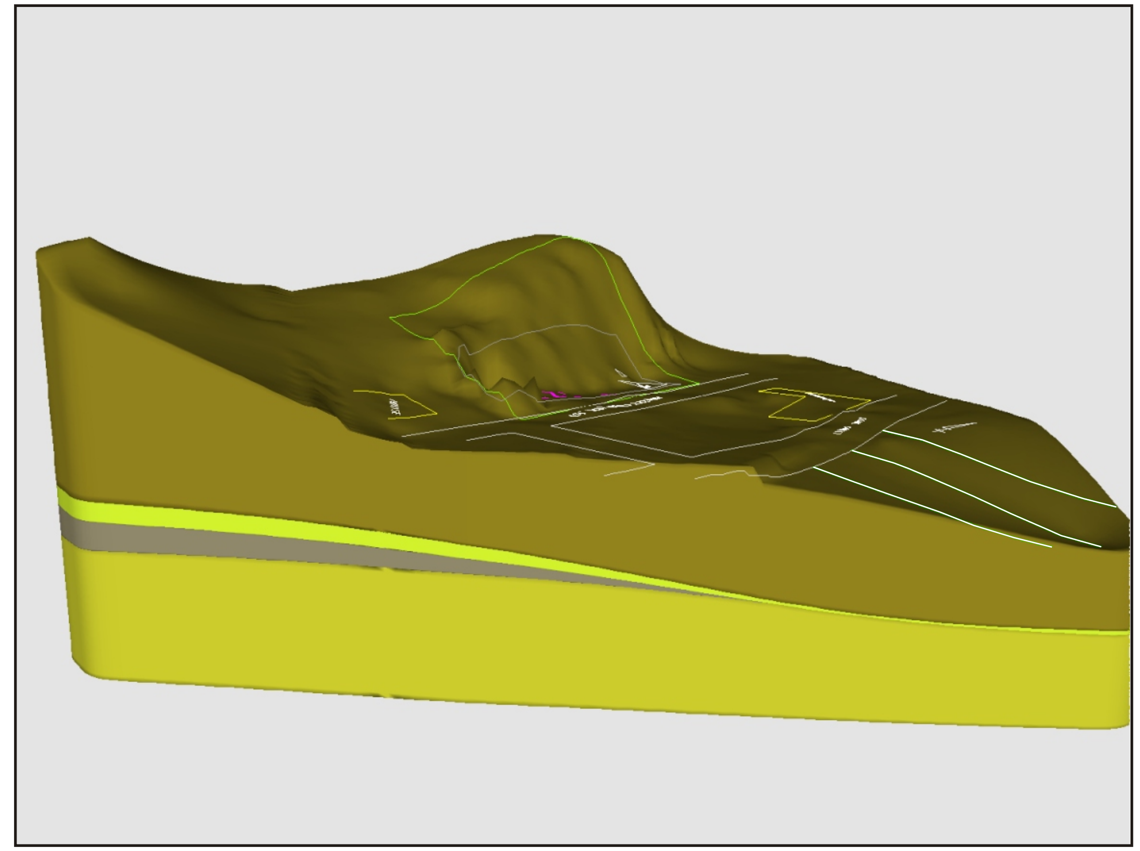
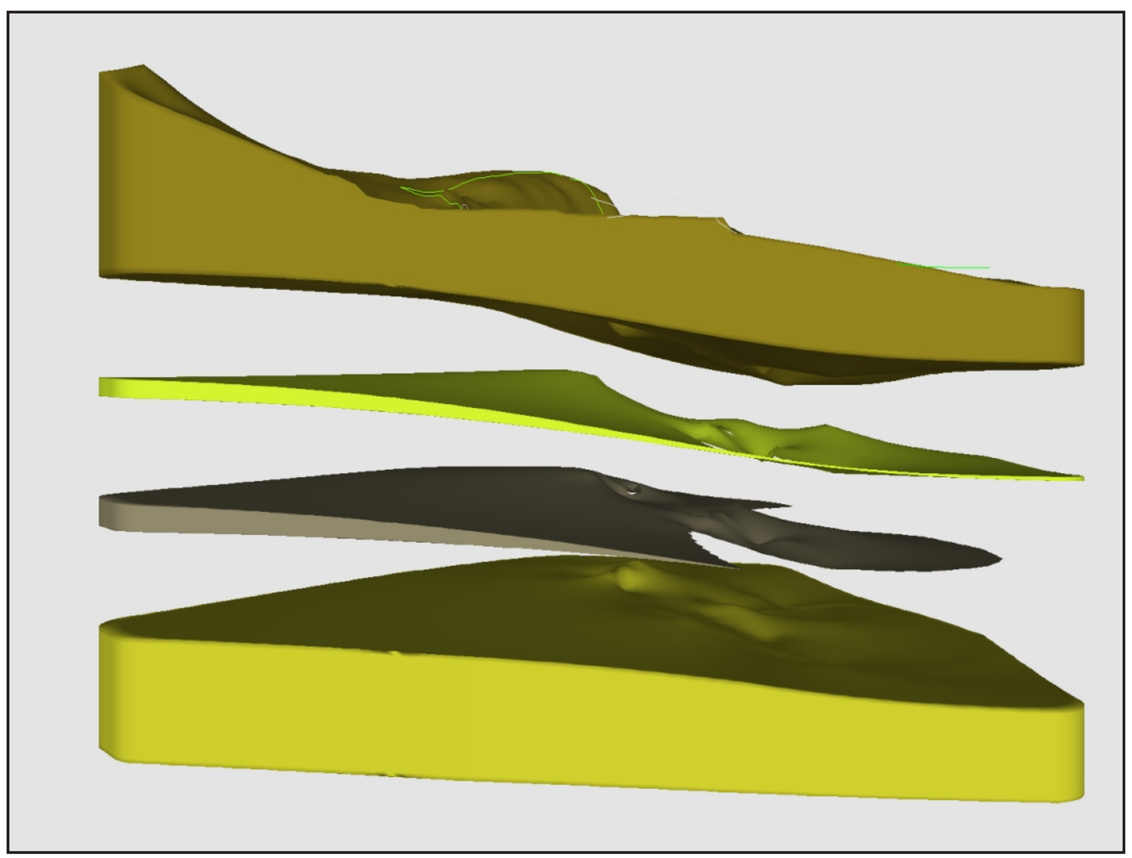
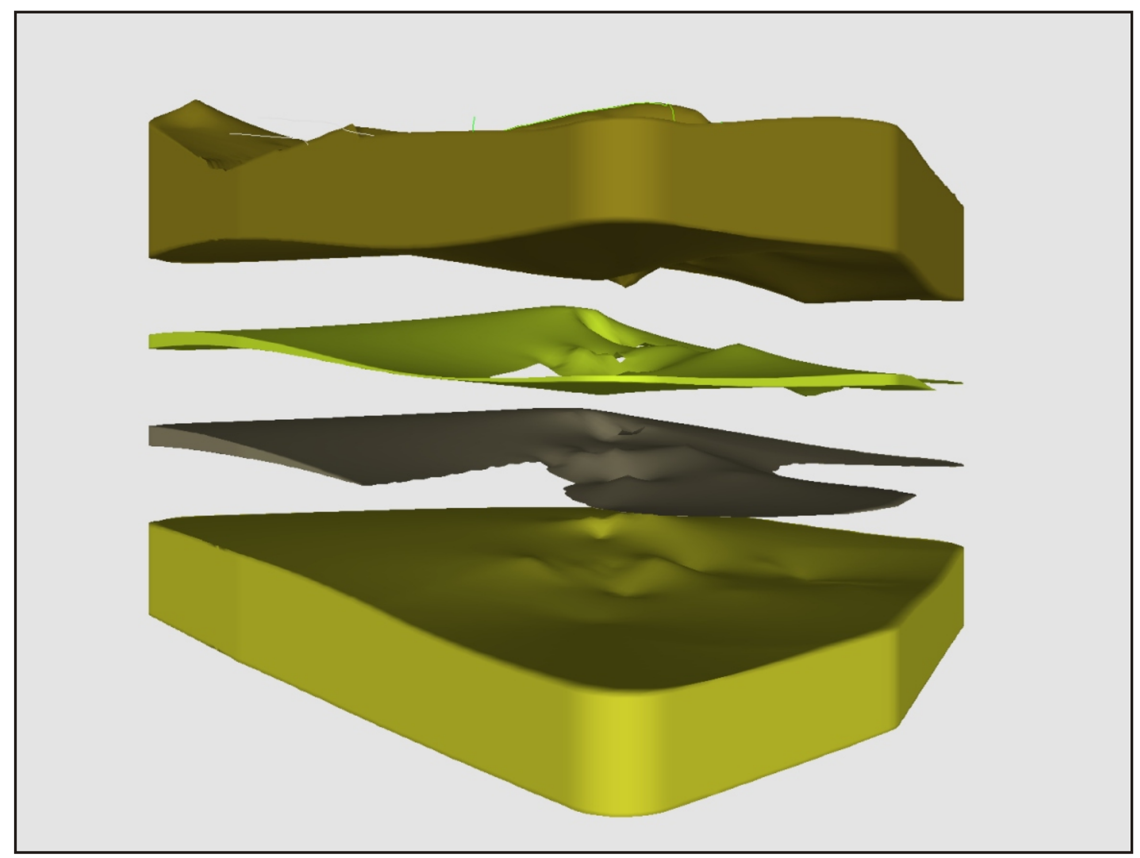
GEOLOGY IN PLAN VIEW



GEOLOGY CROSS SECTION FACING NORTHWEST



GEOLOGY CROSS SECTION - EXPANDED - FACING NORTHEST



GEOLOGY CROSS SECTION - EXPANDED - FACING WEST

LEGEND:

- FILL
- SILT AND CLAY
- SAND AND GRAVEL
- SILT
- FORMER MGP PROPERTY

NOTE:

VERTICAL EXAGGERATION = 3V, H1

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE

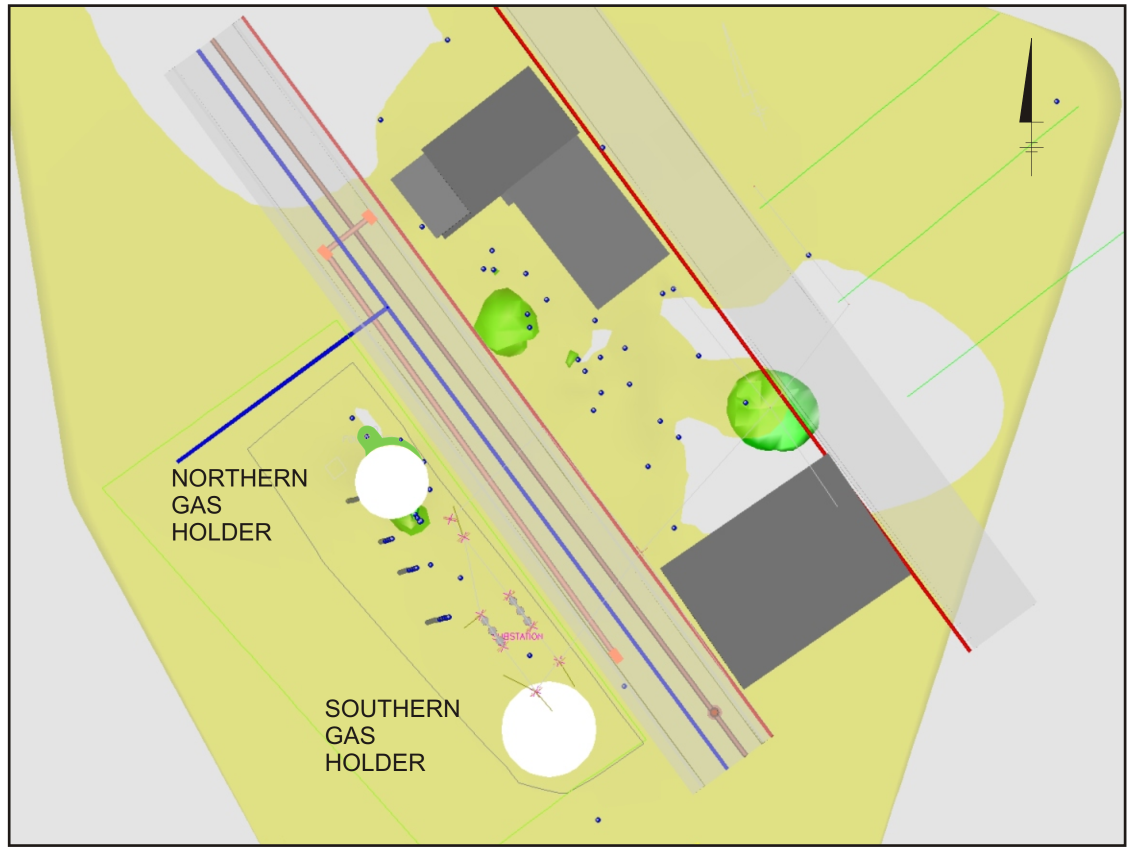
FEASIBILITY STUDY REPORT

STRATIGRAPHIC UNITS

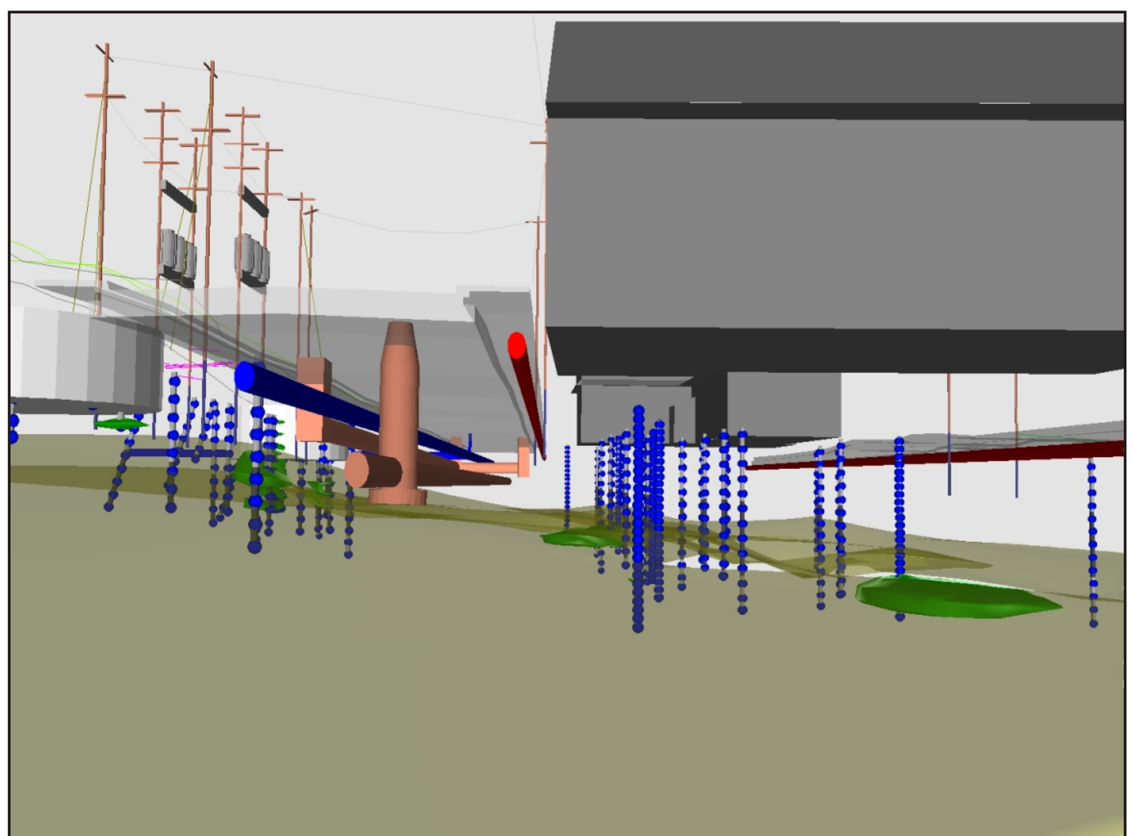
ARCADIS

FIGURE
1-3

01/17/08 SYR-D85-KLS, DJH
B0036675/0000/00004/CDR/36675G01.CDR



PLAN VIEW - INCLUDES SILT AND CLAY UNIT



OBLIQUE VIEW - FACING NORTHEAST - INCLUDES SILT AND CLAY UNIT

LEGEND:

- VISUAL EVIDENCE OF SHEEN AND/OR NAPL

BOREHOLE TRACE

SAMPLE LOCATION

GAS LINE

STORM SEWER LINE

WATER LINE

SEWER LINE

UTILITY POLE

TRANSFORMER

NOTES:

1. ALL UTILITY AND BUILDING LOCATIONS ARE APPROXIMATE.

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE

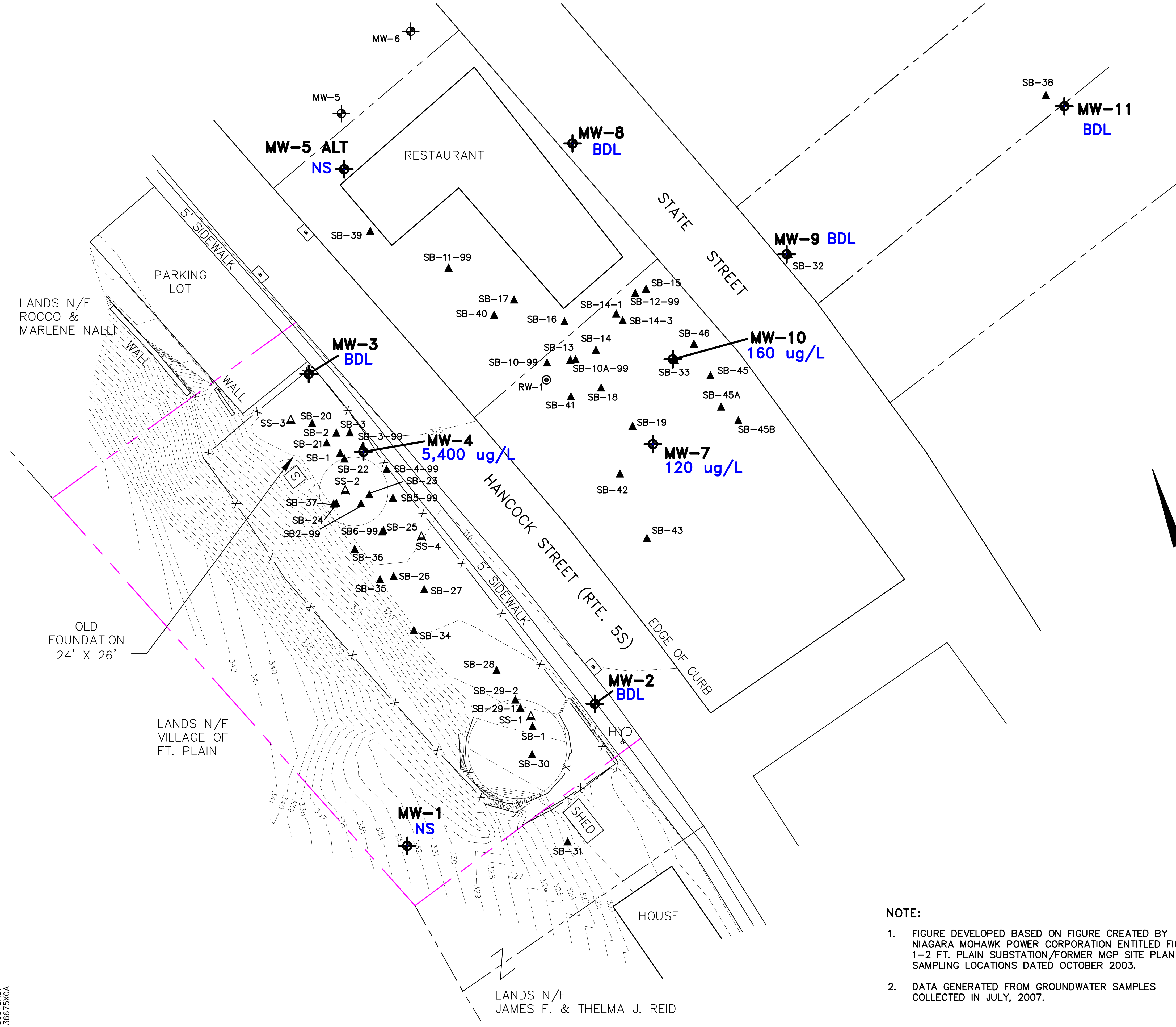
FEASIBILITY STUDY REPORT

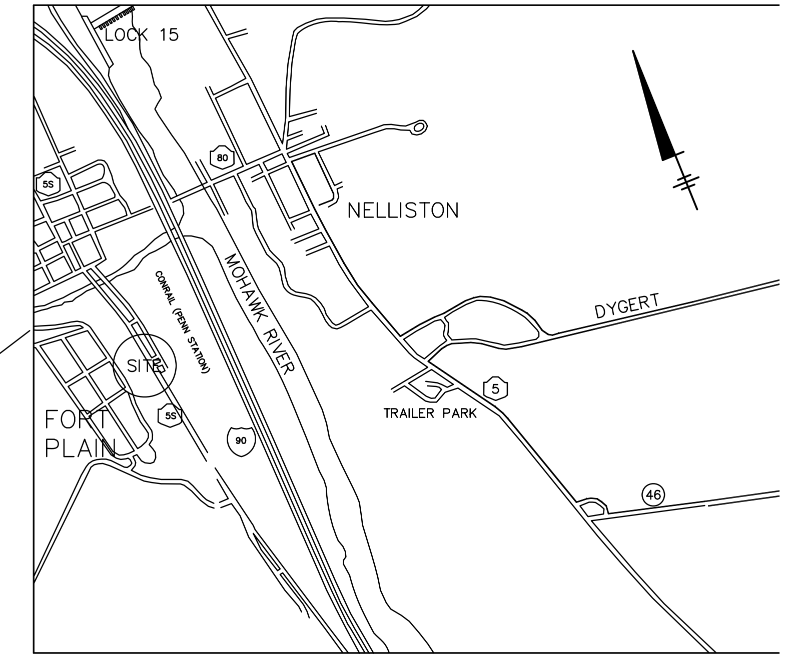
VISUAL EVIDENCE OF MGP IMPACTS

ARCADIS

FIGURE
1-4

01/17/08 SYR-D85-KLS, DJH
B0036675/0000/00004/CDR/36675G02.CDR





LOCATION SKETCH
NOT TO SCALE

LEGEND:

- NATIONAL GRID PROPERTY LINE
- NON NATIONAL GRID PROPERTY LINE
- FENCE
- CB CATCH BASIN
- S SANITARY SEWER
- HYDRANT
- SOIL BORING
- SOIL SAMPLE
- MONITORING WELL
- RECOVERY WELL
- FORMER STRUCTURE ACCORDING TO 1929 NYP&L CORP. DRAWING G-664
- ug/L MICROGRAMS PER LITER
- NS WELL COULD NOT BE LOCATED AND THEREFORE, WAS NOT SAMPLED
- BDL ANALYTES WERE NOT DETECTED ABOVE DETECTION LIMITS

0 40' 80'
GRAPHIC SCALE

NOTE:

1. FIGURE DEVELOPED BASED ON FIGURE CREATED BY NIAGARA MOHAWK POWER CORPORATION ENTITLED FIGURE 1-2 FT. PLAIN SUBSTATION/FORMER MGP SITE PLAN AND SAMPLING LOCATIONS DATED OCTOBER 2003.
2. DATA GENERATED FROM GROUNDWATER SAMPLES COLLECTED IN JULY, 2007.

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

BTEX IN GROUNDWATER (ug/L)

ARCADIS

FIGURE
1-5

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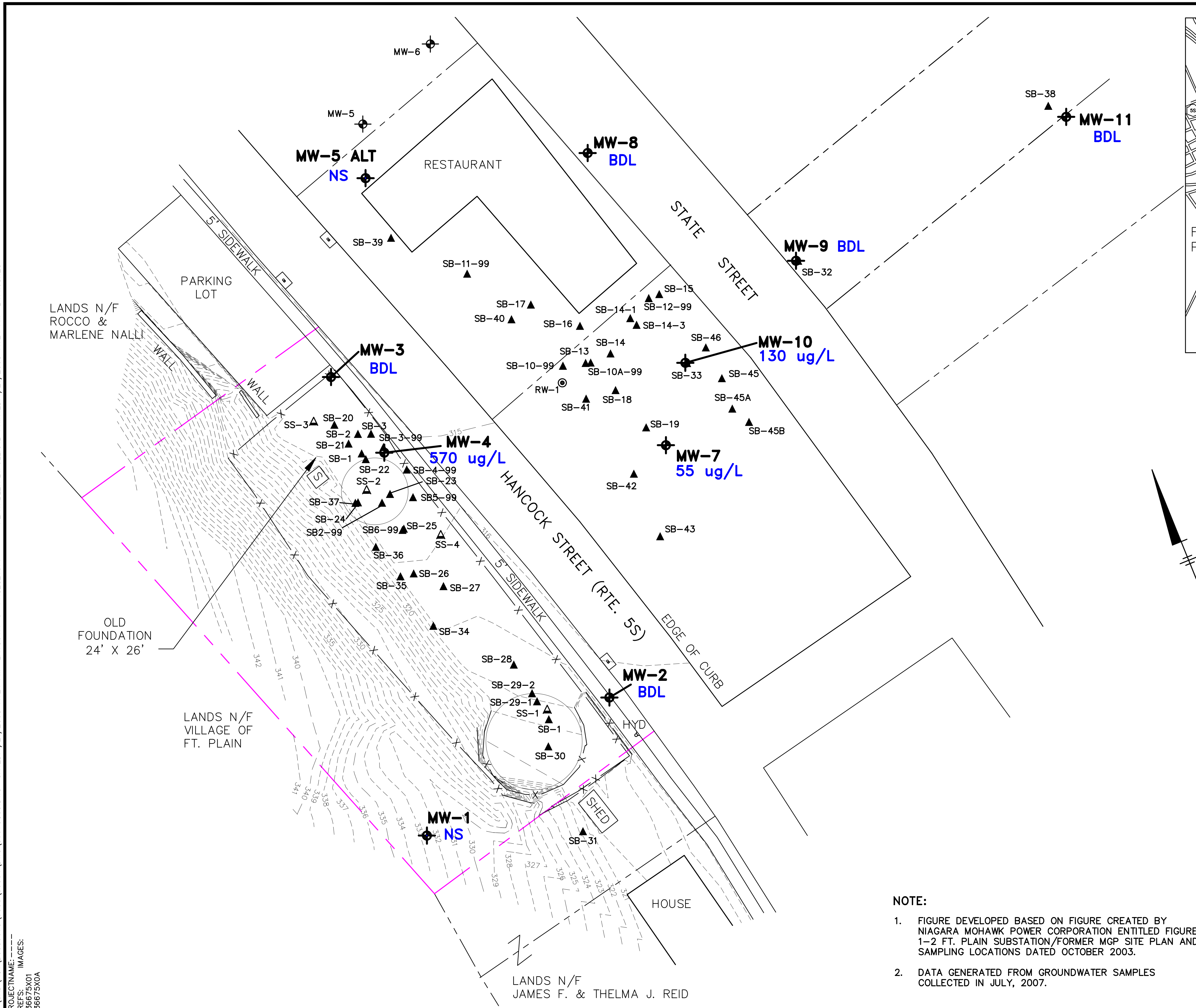

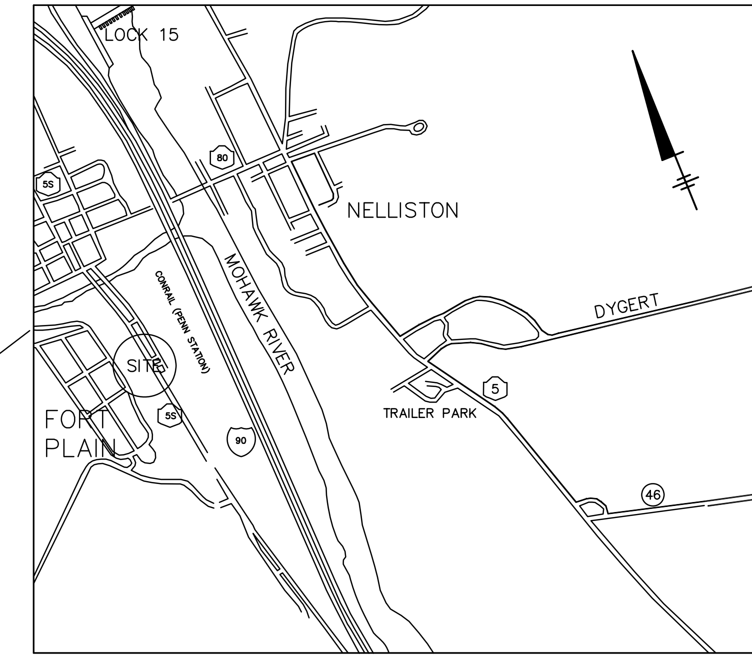

LOCATION SKETCH
NOT TO SCALE

LEGEND:

- NATIONAL GRID PROPERTY LINE
- NON NATIONAL GRID PROPERTY LINE
- FENCE
- CB CATCH BASIN
- S SANITARY SEWER
- HYDRANT
- SOIL BORING
- SOIL SAMPLE
- MONITORING WELL
- RECOVERY WELL
- FORMER STRUCTURE ACCORDING TO 1929 NYP&L CORP. DRAWING G-664
- ug/L MICROGRAMS PER LITER
- NS WELL COULD NOT BE LOCATED AND THEREFORE, WAS NOT SAMPLED
- BDL ANALYTES WERE NOT DETECTED ABOVE DETECTION LIMITS

0 40' 80'
GRAPHIC SCALE

NOTE:

1. FIGURE DEVELOPED BASED ON FIGURE CREATED BY NIAGARA MOHAWK POWER CORPORATION ENTITLED FIGURE 1-2 FT. PLAIN SUBSTATION/FORMER MGP SITE PLAN AND SAMPLING LOCATIONS DATED OCTOBER 2003.
2. DATA GENERATED FROM GROUNDWATER SAMPLES COLLECTED IN JULY, 2007.

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

PAHs IN GROUNDWATER (ug/L)

ARCADIS

FIGURE
6

SYR-85-GMS DMW MLJ LAYER: ON=*, OFF=*REF*
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PROJECTNAME: ----
XREFS: IMAGES:
36675X01
36675X0A

NOTES:

1. ALL UTILITY LOCATIONS ARE APPROXIMATE.
2. FRAME BUILDING LOCATION IS APPROXIMATE
3. A PORTION OF HANCOCK STREET MAY BE USED DURING IMPLEMENTATION OF PORTIONS OF THIS ALTERNATIVE; PEDESTRIAN AND VEHICULAR TRAFFIC WOULD BE DIVERTED DURING THESE ACTIVITIES.

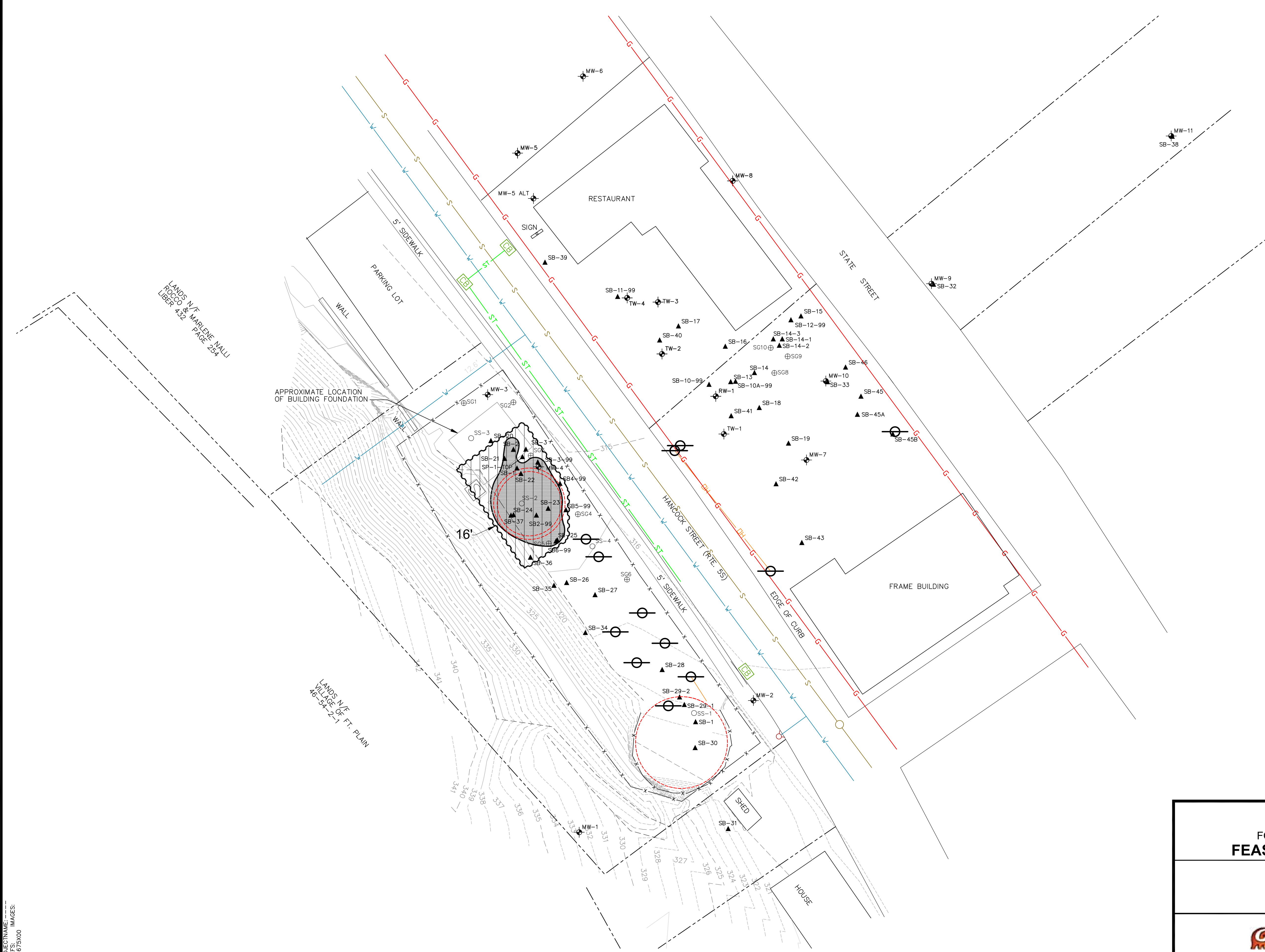
NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE

FEASIBILITY STUDY REPORT

ALTERNATIVE SM2

ARCADIS

FIGURE **5-1**



LEGEND:

- APPROXIMATE EXTENT OF MGP – IMPACTED MATERIAL
- PROPOSED EXCAVATION LIMITS
- APPROXIMATE LOCATION OF SHEET PILE WALL
- 16' APPROXIMATE DEPTH OF SILT AND CLAY CONFINING UNIT
- PROPERTY LINE
- LOCATION OF FORMER GAS HOLDERS
- FENCE
- ST STORM SEWER LINE
- G GAS LINE
- W WATER LINE
- S SEWER LINE
- OH OVERHEAD ELECTRIC
- CB CATCH BASIN
- S SANITARY SEWER
- UTILITY POLE
- SB-17 SOIL BORING
- MW-10 MONITORING WELL/ TEMPORARY WELL

NOTES:

1. ALL UTILITY LOCATIONS ARE APPROXIMATE.
2. FRAME BUILDING LOCATION IS APPROXIMATE.
3. A PORTION OF HANCOCK STREET MAY BE USED DURING IMPLEMENTATION OF PORTIONS OF THIS ALTERNATIVE; PEDESTRIAN AND VEHICULAR TRAFFIC WOULD BE DIVERTED DURING THESE ACTIVITIES.

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE

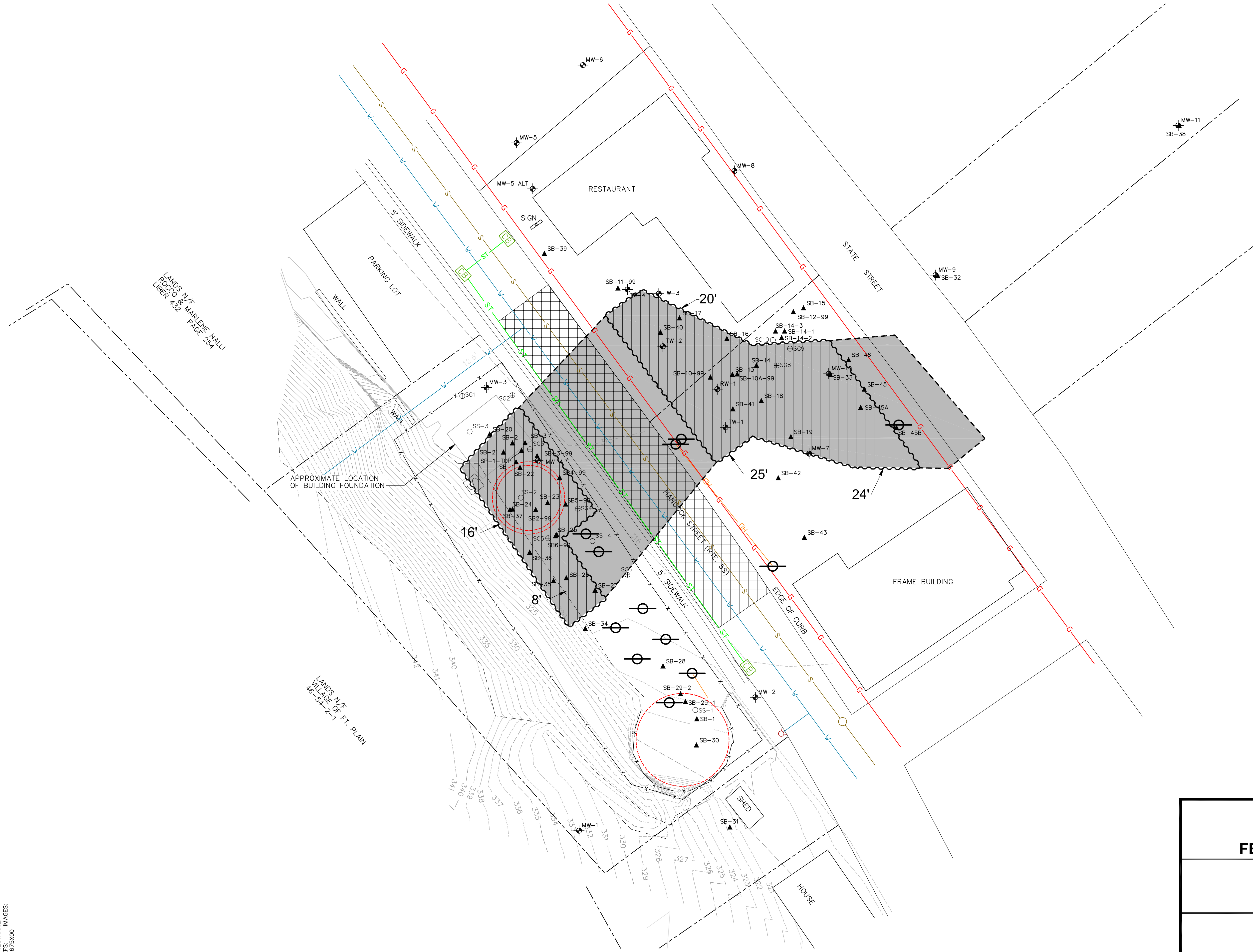
FEASIBILITY STUDY REPORT

ALTERNATIVE SM3

ARCADIS

FIGURE

5-2



LEGEND:

- PROBABLE LIMITS OF SOIL CONTAINING CONSTITUENTS GREATER THAN 6 NYCRR PART 375 COMMERCIAL SOIL CLEANUP OBJECTIVES
- FEASIBLE EXCAVATION AREAS
- APPROXIMATE LOCATION OF SHEET PILE WALL
- 8' APPROXIMATE DEPTH OF BOTTOM OF SOIL CONTAINING CONSTITUENTS GREATER THAN 6 NYCRR PART 375 COMMERCIAL SOIL CLEANUP OBJECTIVES
- PROPOSED WORK AREA IN HANCOCK STREET
- PROPERTY LINE
- LOCATION OF FORMER GAS HOLDERS
- FENCE
- ST STORM SEWER LINE
- G GAS LINE
- W WATER LINE
- S SEWER LINE
- OH OVERHEAD ELECTRIC
- CB CATCH BASIN
- S SANITARY SEWER
- UTILITY POLE
- SB-17 SOIL BORING
- MW-10 MONITORING WELL/ TEMPORARY WELL

NOTES:

1. ALL UTILITY LOCATIONS ARE APPROXIMATE.
2. FRAME BUILDING LOCATION IS APPROXIMATE.

0 20' 40'
GRAPHIC SCALE

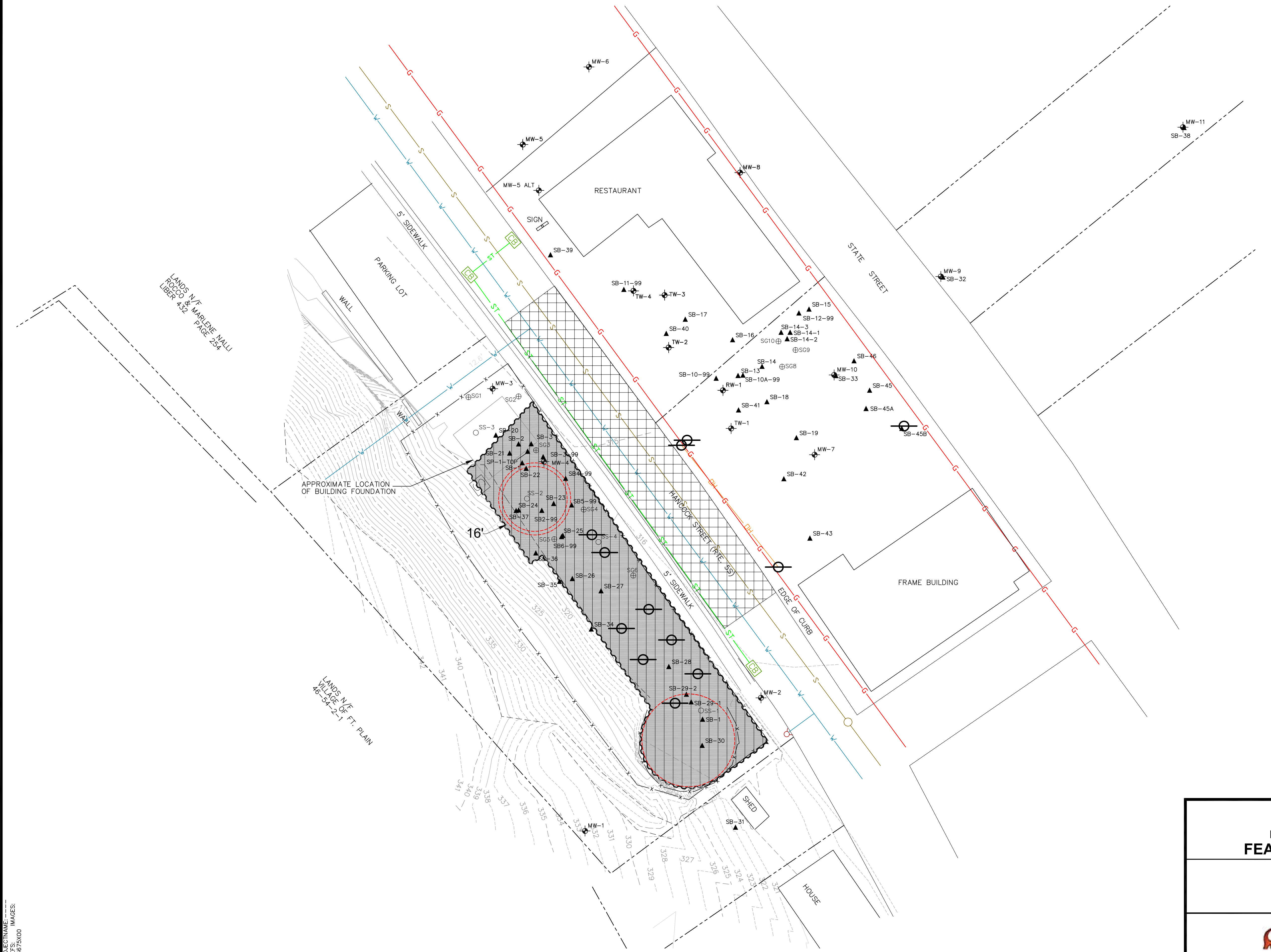
NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

ALTERNATIVE SM4

ARCADIS

FIGURE
5-3

SYR-85-TJR AMS WLJ LAYER: ON=*; OFF=*REF*
G:\CAD\ACT\B0036675\0000\00004\DWG\36675G06.DWG SAVED:2/22/2008 1:55 PM LAYOUT:5-3 PAGESETUP:---- PENTABLE:PLTFULL.CTB PRINTED:2/22/2008 1:56 PM BY:WJONES
PROJECTNAME:----
XREFS: IMAGES:
36675X00



LEGEND:

- PROBABLE LIMITS OF SOIL CONTAINING CONSTITUENTS GREATER THAN 6 NYCRR PART 375 UNRESTRICTED SOIL CLEANUP OBJECTIVES (ON-SITE)
- FEASIBLE EXCAVATION AREAS
- APPROXIMATE LOCATION OF SHEET PILE WALL
- 16' — APPROXIMATE DEPTH OF BOTTOM OF SOIL CONTAINING CONSTITUENTS GREATER THAN 6 NYCRR PART 375 UNRESTRICTED SOIL CLEANUP OBJECTIVES
- PROPOSED WORK AREA IN HANCOCK STREET
- PROPERTY LINE
- LOCATION OF FORMER GAS HOLDERS
- x — x — FENCE
- ST — STORM SEWER LINE
- G — GAS LINE
- W — WATER LINE
- S — SEWER LINE
- OH — OVERHEAD ELECTRIC
- CB — CATCH BASIN
- S — SANITARY SEWER
- UTILITY POLE
- SB-17 — SOIL BORING
- MW-10 — MONITORING WELL/ TEMPORARY WELL

NOTES:

1. ALL UTILITY LOCATIONS ARE APPROXIMATE.
2. FRAME BUILDING LOCATION IS APPROXIMATE.

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE

FEASIBILITY STUDY REPORT

ALTERNATIVE SM5

ARCADIS

FIGURE
5-4

LEGEND:

	PROPERTY LINE
	LOCATION OF FORMER GAS HOLDERS
	FENCE
ST	STORM SEWER LINE
G	GAS LINE
W	WATER LINE
S	SEWER LINE
OH	OVERHEAD ELECTRIC
	APPLICATION WELL (PROPOSED)
CB	CATCH BASIN
S	SANITARY SEWER
	UTILITY POLE
SB-17	SOIL BORING
MW-10	MONITORING WELL/ TEMPORARY WELL
0.16 mg/L	TOTAL BTEX

NOTES:

1. LOCATION OF APPLICATION WELLS ARE APPROXIMATE. FINAL APPLICATION WELL CONFIGURATION WILL BE DETERMINED AS PART OF THE REMEDIAL DESIGN.
2. MOST RECENT GROUNDWATER DATA AVAILABLE IS PROVIDED ON THE FIGURE.
3. ALL UTILITY LOCATIONS ARE APPROXIMATE.
4. FRAME BUILDING LOCATION IS APPROXIMATE.
5. mg/L – MILLIGRAM PER LITER
BDL – ANALYTES WERE NOT DETECTED ABOVE DETECTION LIMITS

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

ALTERNATIVE GW3

ARCADIS

FIGURE
5-5

ARCADIS

Tables

TABLE 1-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Historical Groundwater Data

BTEX in Groundwater (ug/l)

Monitoring Well I.D.	Sampling Date								
	Jul '97	Oct '97	May '99	Jun '99	July '01	July '03	Nov '04	8-Sep-05	July '07
MW-1	BDL	BDL	BDL	0.2	BDL	-	BDL	-	-
MW-2	BDL	BDL	BDL	0.3	1.5	-	BDL	-	BDL
MW-3	-	1.0	BDL	BDL	BDL	-	BDL	-	BDL
MW-4	7,050	459	34	BDL	1,180	-	26.9	4,600	5,400
MW-5	-	-	0.3	BDL	BDL	-	BDL	-	-
MW-6	-	-	36.9	164	3	-	-	-	-
MW-7	-	-	47	33.3	65.4	-	93.3	8	120
MW-8	-	-	-	-	-	-	BDL	-	BDL
MW-9	-	-	-	-	-	-	BDL	-	BDL
MW-10	-	-	-	-	-	-	409.7	188.6	160
MW-11	-	-	-	-	-	-	BDL	-	BDL

PAHs in Groundwater (ug/l)

Monitoring Well I.D.	Sampling Date								
	Jul '97	Oct '97	May '99	Jun '99	July '01	July '03	Nov '04	8-Sep-05	July '07
MW-1	1.0	5.8	BDL	BDL	BDL	-	BDL	-	-
MW-2	BDL	0.2	BDL	BDL	BDL	-	BDL	-	BDL
MW-3	-	3.1	BDL	BDL	BDL	-	BDL	-	BDL
MW-4	2,074	261.0	229.0	21.2	60.1	-	8.6	345.0	570.0
MW-5	-	-	0.5	BDL	BDL	-	BDL	-	-
MW-6	-	-	9.4	1.4	BDL	-	-	-	-
MW-7	-	-	249.0	214.8	56.7	-	57.4	35.0	55.0
MW-8	-	-	-	-	BDL	-	BDL	-	BDL
MW-9	-	-	-	-	-	3.0	BDL	-	BDL
MW-10	-	-	-	-	-	569.0	335.3	59.0	130.0
MW-11	-	-	-	-	-	3.0	BDL	-	BDL

Note: because differenct methods were used to analyze groundwater samples from 1997 to present, tables present Total BTEX (rather than Total VOCs) and Total PAHs (rather than Total SVOCs)

TABLE 2-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Chemical-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Federal				
Clean Water Act (CWA) - Ambient Water Quality Criteria	40 CFR Part 131; EPA 440/5-86/001 "Quality Criteria for Water - 1986", superceded by EPA-822-R-02-047 "National Recommended Water Quality Criteria: 2002"	S	Criteria for protection of aquatic life and/or human health depending on designated water use.	Criteria may be applicable for assessing water quality in Otsquago Creek during remedial activities.
CWA Section 136	40 CFR 136	G	Identifies guidelines for test procedures for the analysis of pollutants.	Applicable to water monitoring associated with National Pollutant Discharge Elimination System (NPDES) permitted discharges.
CWA Section 404	33 USC 1344	S	Regulates discharges to surface water or ocean, indirect discharges to POTWs, and discharge of dredged or fill material into waters of the U.S. (including wetlands).	Potentially applicable for remedial activities that include dredging or capping and/or the treatment of water generated during excavation and dewatering activities.
National Primary Drinking Water Standards	40 CFR Part 141	S	Establishes maximum contaminant levels (MCLs) which are health-based standards for public water supply systems.	These standards are potentially applicable if an action involves future use of ground water as a public supply source.
RCRA- Regulated Levels for Toxic Characteristics Leaching Procedure (TCLP) Constituents	40 CFR Part 261	S	These regulations specify the TCLP constituent levels for identification of hazardous wastes that exhibit the characteristic of toxicity.	Excavated soil may be sampled and analyzed for TCLP constituents prior to disposal to determine if the materials are hazardous based on the characteristic of toxicity.
Universal Treatment Standards/Land Disposal Restrictions (UTS/LDRs)	40 CFR Part 268	S	Identify hazardous wastes for which land disposal is restricted and provide a set of numerical constituent concentration criteria at which hazardous waste is restricted from land use.	Applicable if waste is determined to be hazardous and for remedial alternatives involving offsite land disposal.

TABLE 2-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Chemical-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Identification and Listing of Hazardous Wastes	40 CFR Part 261	G	Outlines criteria for determining if a solid waste is a hazardous waste and is subject to regulation under 40 CFR Parts 260-266.	Applicable for determining if soil generated during implementation of remedial activities are hazardous wastes. These regulations do not set cleanup standards, but are considered when developing remedial alternatives.
New York State				
NYSDEC Environmental Remediation Program	6NYCRR Part 375 (11/14/06)	S	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 soil cleanup objectives based on site use.	These guidance values are to be considered, as appropriate, in evaluating soil quality.
NYSDEC Guidance on Determination of Soil Cleanup Objectives and Cleanup Levels	Technical and Administrative Guidance Memorandum (TAGM) #4046 (1/24/94)	G	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.	To be considered, as appropriate, in evaluating soil quality.
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)	G	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.	Applicable as appropriate in the management of MGP-impacted soil and coal tar waste generated during the remedial activities.
NYSDEC Ambient Water Quality Standards and Guidance Values	Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 (6/98)	G	Provides a compilation of ambient water quality standards and guidance values for toxic and non-conventional pollutants for use in the NYSDEC programs.	These standards are to be considered in evaluating groundwater and surface water quality.

TABLE 2-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Chemical-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Identification and Listing of Hazardous Wastes	6 NYCRR Part 371	S	Outlines criteria for determining if a solid waste is a hazardous waste and is subject to regulation under 6 NYCRR Parts 371-376.	Applicable for determining if soil generated during implementation of remedial activities are hazardous wastes. These regulations do not set cleanup standards, but are considered when developing remedial alternatives.
New York State Surface Water and Groundwater Quality Standards	6 NYCRR Part 703	S	Establishes quality standards for surface water and groundwater.	Potentially applicable for assessing water quality at the Site during remedial activities.

TABLE 2-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Action-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Federal				
Occupational Safety and Health Act (OSHA) - General Industry Standards	29 CFR Part 1910	S	These regulations specify the 8-hour time-weighted average concentration for worker exposure to various compounds. Training requirements for workers at hazardous waste operations are specified in 29 CFR 1910.120.	Proper respiratory equipment will be worn if it is not possible to maintain the work atmosphere below required concentrations. Appropriate training requirements will be met for remedial workers.
OSHA - Safety and Health Standards	29 CFR Part 1926	S	These regulations specify the type of safety equipment and procedures to be followed during site remediation.	Appropriate safety equipment will be onsite and appropriate procedures will be followed during remedial activities.
OSHA - Recordkeeping, Reporting and Related Regulations	29 CFR Part 1904	S	These regulations outline recordkeeping and reporting requirements for an employer under OSHA.	These regulations apply to the company(s) contracted to install, operate, and maintain remedial actions at hazardous waste sites.
RCRA - Preparedness and Prevention	40 CFR Part 264.30 - 264.31	S	These regulations outline requirements for safety equipment and spill control when treating, handling and/or storing hazardous wastes.	Safety and communication equipment will be installed at the site as necessary. Local authorities will be familiarized with the Site.
RCRA - Contingency Plan and Emergency Procedures	40 CFR Part 264.50 - 264.56	S	Provides requirements for outlining emergency procedures to be used following explosions, fires, etc. when storing hazardous wastes.	Plans will be developed and implemented during remedial design. Copies of the plan will be kept onsite.
CWA-Discharge to Waters of the U.S., and Section 404	40 CFR Parts 403, and 230 Section 404 (b) (1); 33 USC 1344	S	Establishes site-specific pollutant limitations and performance standards which are designed to protect surface water quality. Types of discharges regulated under CWA include: indirect discharge to a POTW, and discharge of dredged or fill material into U.S. waters.	May be relevant and appropriate for remediation alternatives which discharge water back to Otsquago Creek or that include dredging/filling.

TABLE 2-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Action-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
CWA Section 401	33 U.S.C. 1341	S	Requires that 401 Water Quality Certification permit be provided to federal permitting agency (USACE) for any activity including, but not limited to, the construction or operation of facilities which may result in any discharge into jurisdictional waters of the U.S. and/or State.	Substantive provisions would be potentially applicable to remedial activities that result in a discharge into Otsquago Creek.
90 Day Accumulation Rule for Hazardous Waste	40 CFR Part 262.34	S	Allows generators of hazardous waste to store and treat hazardous waste at the generation site for up to 90 days in tanks, containers, and containment buildings without having to obtain a RCRA hazardous waste permit.	Potentially applicable to remedial alternatives that involve the storing or treating of hazardous materials on-site.
Clean Air Act – National Ambient Air Quality Standards	40 CFR Part 60	S	Establishes ambient air quality standards for protection of public health.	Remedial operations will be performed in a manner that minimizes the production of particulates and airborne constituents.
Rivers and Harbors Act Sections 9 & 10	33 USC 401 and 403; 33 CFR Parts 320-330	S	Prohibits unauthorized obstruction or alteration of navigable waters of the U.S. (dredging, fill, cofferdams, piers, etc.). Requirements for permits affecting navigable waters of the U.S.	Potentially applicable if remedial alternatives implemented in Otsquago Creek fill, span, or otherwise change the cross-sectional profile of the channel.
Land Disposal Facility Notice in Deed	40 CFR Parts 264 and 265 Sections 116-119(b)(1)	S	Establishes provisions for a deed notation for closed hazardous waste disposal units, to prevent land disturbance by future owners.	The regulations are potentially applicable because closed areas may be similar to closed RCRA units.
RCRA-Regulated Levels for Toxic Characteristics Leaching Procedure (TCLP) Constituents	40 CFR Part 261	S	These regulations specify the TCLP constituent levels for identification of hazardous wastes that exhibit the characteristic of toxicity.	Excavated soil may be sampled and analyzed for TCLP constituents prior to disposal to determine if the materials are hazardous based on the characteristic of toxicity.

TABLE 2-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Action-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
RCRA - General Standards	40 CFR Part 264.111	S	General performance standards requiring minimization of need for further maintenance and control; minimization or elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products. Also requires decontamination or disposal of contaminated equipment, structures, and soils.	Proper design considerations will be implemented to minimize the need for future maintenance. Decontamination actions and facilities will be constructed for remedial activities and disassembled after completion.
National Pollution Discharge Elimination System (NPDES)	40 CFR Parts 122 Subpart B, 125, 301, 303, and 307 (Administered under 6 NYCRR 750-758)	S	Establishes permitting requirements for point source discharges; regulates discharge of water into navigable waters including the quantity and quality of discharge.	Substantive requirements are potentially applicable if treated water is discharged from the Site. This regulation is administered by the State of New York under the SPDES.
Standards Applicable to Transporters of Applicable Hazardous Waste - RCRA Section 3003	40 CFR Parts 170-179, 262, and 263	S	Establishes the responsibility of off-site transporters of hazardous waste in the handling, transportation, and management of the waste. Requires manifesting, recordkeeping, and immediate action in the event of a discharge.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.
United States Department of Transportation (USDOT) Rules for Transportation of Hazardous Materials	49 CFR Parts 107 and 171.1 - 172.558	S	Outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous materials.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.
Clean Air Act-National Ambient Air Quality Standards	40 CFR Part 60	S	Establishes ambient air quality standards for protection of public health.	Remedial operations will be performed in a manner that minimizes the production of benzene and particulate matter.

TABLE 2-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Action-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
USEPA-Administered Permit Program: The Hazardous Waste Permit Program	RCRA Section 3005; 40 CFR Part 270.124	S	Covers the basic permitting, application, monitoring, and reporting requirements for off-site hazardous waste management facilities.	Any off-site facility accepting hazardous waste from the site must be properly permitted. Implementation of the site remedy will include consideration of these requirements.
Land Disposal Restrictions	40 CFR Part 368	S	Restricts land disposal of hazardous wastes that exceed specific criteria. Establishes Universal Treatment Standards (UTSs) to which hazardous waste must be treated prior to land disposal.	Excavated soils that display the characteristic of hazardous waste or that are decharacterized after generation must be treated to 90% constituent concentration reduction capped at 10 times the UTS.
RCRA Subtitle C	40 U.S.C. Section 6901 et seq.; 40 CFR Part 268	S	Restricts land disposal of hazardous wastes that exceed specific criteria. Establishes UTSs to which hazardous wastes must be treated prior to land disposal.	Potentially applicable to remedial activities that include the dredging and disposal of soil from the Site.
Underground Injection Control for Class V UIC wells	40 CFR Part 144 Subparts B, C, and G	S	Permitting and notification requirements for the injection of fluids into underground sources of drinking water.	USEPA most be notified prior to implementing any remedial action that includes injection of chemicals into the subsurface as part of the remediation project.
New York State				
Use and Protection of Waters Program	6 NYCRR Part 608	S	Protection of waters permit program regulates: 1) any disturbance of the bed or banks of a protected stream or water course; 2) construction and maintenance of dams; and 3) excavation or fill in navigable waters of the State.	Substantive provisions are potentially applicable to remedial alternatives that disturb a protected water course or include dredging or capping in navigable waters.

TABLE 2-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Action-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Discharges to Public Waters	New York State Environmental Conservation Law, Section 71-3503	S	Provides that a person who deposits 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, is guilty of a misdemeanor.	During the remedial activities, MGP-impacted materials will not be deposited into public waters or sewers.
New York Hazardous Waste Management System - General	6 NYCRR Part 370	S	Provides definitions of terms and general instructions for the Part 370 series of hazardous waste management.	Hazardous waste is to be managed according to this regulation.
Identification and Listing of Hazardous Wastes	6 NYCRR Part 371	S	Outlines criteria for determining if a solid waste is a hazardous waste and is subject to regulation under 6 NYCRR Parts 371-376.	Applicable for determining if soil generated during implementation of remedial activities are hazardous wastes. These regulations do not set cleanup standards, but are considered when developing remedial alternatives.
Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities	6NYCRR Part 372	S	Provides guidelines relating to the use of the manifest system and its recordkeeping requirements. It applies to generators, transporters, and facilities in New York State.	This regulation will be applicable to any company(s) contracted to do treatment work at the site or to transport or manage hazardous material generated at the site.
New York Regulations for Transportation of Hazardous Waste	6 NYCRR Part 372.3 a-d	S	Outlines procedures for the packaging, labeling, manifesting, and transporting of hazardous waste.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.
Waste Transporter Permits	6 NYCRR Part 364	S	Governs the collection, transport, and delivery of regulated waste within New York State.	Properly permitted haulers will be used if any waste materials are transported off-site.
NYSDEC Technical and Administrative Guidance Memorandums (TAGMs)	NYSDEC TAGMs	G	TAGMs are NYSDEC guidance that are to be considered during the remedial process.	Appropriate TAGMs will be considered during the remedial process.

TABLE 2-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Action-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
New York Regulations for Hazardous Waste Management Facilities	6 NYCRR Part 373.1.1 - 373.1.8	S	Provides requirements and procedures for obtaining a permit to operate a hazardous waste treatment, storage, and disposal facility. Also lists contents and conditions of permits.	Any off-site facility accepting waste from the site must be properly permitted.
New York State Pollution Discharge Elimination System (SPDES)	6 NYCRR Parts 750-758	S	These regulations detail the permit requirements for the discharge of pollutants to the waters of New York State.	Water discharged from the site would be treated and discharged in accordance with NYSDEC SPDES permit requirements.
Management of Soil and Sediment Contaminated With Coal Tar From Former Manufactured Gas Plants	NYSDEC Program Policy	G	Purpose of the guidance is to facilitate the permanent treatment of soil impacted with coal tar from the sites of former MGPs.	Policy will be considered for D018 hazardous and non-hazardous soil removed during removal activities.
Land Disposal of a Hazardous Waste	6 NYCRR Part 376	S	Restricts land disposal of hazardous wastes that exceed specific criteria.	New York defers to USEPA for UTS/LDR regulations.
NYSDEC Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants (“MGPs”)	TAGM 4061(2001)	G	Outlines the criteria for conditionally excluding coal tar waste and impacted soils and sediment 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.	This guidance will be used as appropriate in the management of MGP-impacted soil and coal tar waste generated during the remedial activities.

TABLE 2-3

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Location-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Federal				
National Environmental Policy Act Executive Orders 11988 and 11990	40 CFR 6.302; 40 CFR Part 6, Appendix A	S	Requires federal agencies, where possible, to avoid or minimize adverse impact of federal actions upon wetlands/floodplains and enhance natural values of such. Establishes the "no-net-loss" of waters/wetland area and/or function policy.	To be considered if remedial activities are conducted within the floodplain or wetlands.
CWA Section 404	33 USC 1344, Section 404; 33 CFR Parts 320-330; 40 CFR Part 230	S	Discharge of dredge or fill materials into waters of the U.S., including wetlands, are regulated by the USACE.	Substantive provisions are potentially applicable to remedial activities resulting in the discharge of dredge or fill materials into jurisdictional waters/wetlands on or near the Site.
Fish and Wildlife Coordination Act	16 USC 661; 40 CFR 6.302	S	Actions must be taken to protect fish or wildlife when diverting, channeling, or otherwise modifying a stream or river.	Potentially applicable to remedial activities that result in modifications to the Otsquago Creek.
Historical and Archaeological Data Preservation Act	16 USC 469a-1	S	Provides for the preservation of historical and archaeological data that might otherwise be lost as the result of alteration of the terrain.	Potentially applicable if activities will affect historical data in or near the Site.
National Historic and Historical Preservation Act	16 USC 470; 36 CFR Part 65; 36 CFR Part 800	S	Requirements for the preservation of historic properties.	Activities taking place on a site that is on or under consideration for placement on the National Register of Historic Places must be planned to preserve the historic property and minimize harm.
Endangered Species Act	16 USC 1531 et seq.; 50 CFR Part 200; 50 CFR Part 402	S	Requires federal agencies to confirm that the continued existence of any endangered or threatened species and their habitat will not be jeopardized by a site action.	May be applicable to any endangered species determined to be present on the site.

TABLE 2-3

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

Potential Location-Specific SCGs

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Floodplains Management and Wetlands Protection	40 CFR 6 Appendix A; 40 CFR 6.302	S	Activities taking place within floodplains and/or wetlands must be conducted to avoid adverse impacts and preserve beneficial value. Procedures for floodplain management and wetlands protection provided.	To be considered if remedial activities are conducted within the floodplain or wetlands.
New York State				
New York State Floodplain Management Development Permits	6 NYCRR Part 500	S	Provides conditions necessitating NYSDEC permits and provides definitions and procedures for activities conducted within floodplains.	Substantive provisions would be potentially applicable to remedial activities conducted within a floodplain.
New York State Freshwater Wetlands Act	ECL Article 24 and 71; 6 NYCRR Parts 662-665	S	Activities in wetlands areas must be conducted to preserve and protect wetlands.	Potentially applicable to remedial activities conducted in jurisdictional wetlands that have been identified on the Site.
New York State Parks, Recreation, and Historic Preservation Law	New York Executive Law Article 14;	S	Requirements for the preservation of historic properties.	Potentially applicable to remedial activities conducted in the vicinity of an historic structure.
Endangered & Threatened Species of Fish and Wildlife	6 NYCRR Part 182	S	Identifies endangered and threatened species of fish and wildlife in New York.	Remedial activities will be designed in consideration of the potential presence of endangered and threatened species of fish and wildlife.
New York Preservation of Historic Structures or Artifacts	New York State Historic Preservation Act, Section 14.09	S	Requirements for preservation of historical/ archeological artifacts.	Activities must be done to identify, preserve, and recover artifacts if the site has been identified as containing significant historical artifacts.
Local Building Permits	N/A	S	Local authorities may require a permit for permanent or semi-permanent structure, such as an on-site water treatment system building or retaining wall.	Substantive provisions are potentially applicable to remedial activities that require construction of permanent or semi-permanent structures.

TABLE 4-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR SUBSURFACE SOIL

General Response Action	Technology Type	Technology Process Option	Description of Option/Comments	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
No Further Action	No Further Action	No Further Action	Alternative would not include any active remedial action. A No Further Action alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives. Consideration of a No Further Action alternative is required by the NCP and USEPA.	Maintenance of the existing surface cover would not be performed. Would not achieve RAOs for soil of eliminating or reducing the source of MGP-related groundwater impacts. May not achieve RAOs for eliminating or reducing, to the extent practicable, contact with, inhalation of, or ingestion of soil.	Implementable	Low	Yes
Institutional Controls	Institutional Controls	Governmental Controls, Proprietary Controls, Enforcement and Permit Controls, Informational Devices	Institutional controls would include legal and/or administrative controls that mitigate the potential for exposure to impacted soils and/or the potential to jeopardize the integrity of a remedy. Examples of potential institutional controls include establishing land use restrictions, health and safety requirements for subsurface activities, and restrictions on groundwater use and/or extraction.	This option would not meet the RAOs for eliminating or reducing, to the extent practical, areas containing sources of MGP-related impacts or off-site migration of MGP-related COCs. This option could reduce potential exposures, and may be effective when combined with other process options.	Implementable	Low	Yes
In-Situ Containment/ Controls	Surface Controls	Maintain Existing Surface Materials	The existing surface cover (e.g., stone) would be maintained to achieve the RAOs of eliminating or reducing, to the extent practicable, contact with, inhalation of, or ingestion of MGP-related COCs in soil.	Current and future use of site is as a substation; therefore, considered effective.	Easily implementable. Resources to maintain the existing cover are readily available.	Low	Yes
	Capping	Clay/Soil Cap	Placing and compacting clay material or soil material over impacted soil.	May reduce the mobility of chemical constituents by reducing infiltration; would not reduce toxicity or volume of impacts, or further off-site migration of MGP-related COCs. Current and future use of site is as a substation. Long-term effectiveness requires ongoing maintenance.	Implementable. Equipment and materials necessary to construct the cap are readily available.	Moderate capital and O&M costs.	No

TABLE 4-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR SUBSURFACE SOIL

General Response Action	Technology Type	Technology Process Option	Description of Option/Comments	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
In-Situ Containment/ Controls (cont'd)	Capping (cont'd)	Asphalt/Concrete Cap	Application of a layer of asphalt or concrete over impacted soils.	May reduce the mobility of chemical constituents by reducing infiltration; would not reduce toxicity or volume of impacts, or further off-site migration of MGP-related COCs. Asphalt concrete cap is consistent with current and future site uses. Long-term effectiveness requires ongoing maintenance.	Implementable. Equipment and materials necessary to construct the cap are readily available.	Moderate capital and O&M costs.	No
		Multi-Media Cap	Application of a combination of clay/soils and synthetic membrane(s) over impacted soil.	May reduce the mobility of chemical constituents by reducing infiltration; would not reduce toxicity or volume of impacts, or further off-site migration of MGP-related COCs. Current and future use of site is as a substation. Long-term effectiveness requires ongoing maintenance.	Implementable. Equipment and materials necessary to construct the cap are readily available.	High capital and O&M costs.	No
	Containment	Sheetpile	Steel sheetpiles are driven into the subsurface to contain impacted soils and NAPLs. The sheetpile wall is typically keyed into a confining unit and could be permeable or impermeable to groundwater flow.	Effective for reducing the migration of COCs and NAPL. May help achieve RAOs when combined with treatment/removal technology.	Potentially Implementable. Equipment and materials necessary to install sheetpile barriers are readily available. Potential subsurface and overhead obstructions will limit locations for technology use.	High capital and O&M costs.	Yes- retained to support other process options; not as a stand-alone technology

TABLE 4-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR SUBSURFACE SOIL

General Response Action	Technology Type	Technology Process Option	Description of Option/Comments	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
In-Situ Containment/ Controls (cont'd)	Containment (cont.)	Slurry Walls	Involves excavating a trench and adding a slurry (e.g., soil/cement-bentonite mixture) to control migration of subsurface impacts, groundwater and NAPL from an area. Slurry walls are typically keyed into a low permeability unit (e.g., an underlying silt/clay layer).	Effective for reducing the migration of groundwater, COCs, and NAPL. May help achieve RAOs when combined with treatment/removal technology.	Potentially Implementable. Equipment and materials required to install slurry walls are readily available. Presence of underground MGP structures, overhead obstructions, presence of steep bank and limited space on site will hinder technology use.	High capital and O&M costs.	No
In-Situ Treatment	Immobilization	Solidification/ Stabilization	Addition of material to the impacted soil that limits the solubility or mobility of the constituents present. Involves treating soil to produce a stable, non-leachable material, that physically or chemically locks the constituents within the solidified matrix.	Overall effectiveness of this process would need to be evaluated during a bench-scale treatability study. Underground structures (gas holders) and obstructions would need to be removed.	Potentially implementable. Solidification/ stabilization materials are readily available. Presence of underground utilities and/or gas holder structures would hinder technology use. Technology may alter groundwater patterns and affect current conditions of the dissolved plume and COC migration.	Moderate capital and O&M costs.	No

TABLE 4-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR SUBSURFACE SOIL

General Response Action	Technology Type	Technology Process Option	Description of Option/Comments	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
In-Situ Treatment (cont.)	Steam Injection/ Extraction	Dynamic Underground Stripping and Hydrous Pyrolysis/Oxidation (DUS/HPO)	Steam is injected into the subsurface to mobilize COCs and NAPLs. The mobilized contaminants are captured and constituents are re-condensed, collected, and treated. In addition, HPO can degrade contaminants in subsurface heated zones. In most cases, this technology requires long-term operation and maintenance of on-site injection, collection and/or treatment systems.	This option would require a pilot scale study to determine effectiveness. Underground structures and obstructions would need to be removed prior to implementation. Mobilization of dissolved plume a concern.	Potentially implementable. Process may result in uncontrolled NAPL migration. Limited space for vapor recovery system and treatment. Presence of underground MGP structures may hinder technology use.	High	No
	Chemical Treatment	Chemical Oxidation	Oxidizing agents are added to oxidize and reduce the mass of organic constituents *In-situ* chemical oxidation involves the introduction of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate or potassium permanganate. A pilot study would be required to evaluate/determine oxidant application requirements. Large amounts of oxidizing agents would be needed to oxidize NAPL.	Would require multiple treatments of chemicals to reduce COCs. Would not be ineffective at treating tar and tar-saturated soil. Not effective for treating impacts in unsaturated zone. May not be a cost effective means to achieve the RAOs.	Not Implementable. Equipment and materials are readily available; however, underground obstructions exist that limit ability to deliver oxidant to impacts. Recovery of unreacted oxidant and protection of underground utilities may be issues.	High capital and O&M costs.	No
	Biological Treatment	Biodegradation	Natural biological and physical processes that, under favorable conditions, act without human intervention to reduce the mass, volume, concentration, toxicity, and/or mobility of COCs. This process relies on long-term monitoring to demonstrate the reduction of impacts.	Less effective for heavier, more condensed PAHs; not effective for NAPLs; would not achieve RAOs in an acceptable time frame.	Implementable.	Low Capital and Moderate O&M costs.	No
		Enhanced Biodegradation	Addition of amendments (e.g., oxygen, nutrients) and controls to the subsurface to enhance indigenous microbial populations to improve the rate of natural degradation.	Less effective for heavier, more condensed PAHs; not effective for NAPLs.	Implementable	Low Capital and Moderate O&M costs.	No

TABLE 4-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR SUBSURFACE SOIL

General Response Action	Technology Type	Technology Process Option	Description of Option/Comments	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
In-Situ Treatment (cont'd)	Biological Treatment (cont.)	Biosparging	Air/oxygen injection wells are installed within the impacted regions to enhance biodegradation of constituents by increasing oxygen availability. Low-flow injection technology may be incorporated. This technology requires long-term monitoring.	Access to areas that would require injection wells for this process option to be effective is limited, therefore it is not effective as a stand-alone option. Could help to reduce toxicity, mobility, and volume of dissolved constituents when combined with other process options.	Implementable. Equipment capable of installing wells is readily available.	Low Capital and Moderate O&M costs.	No
Removal	Excavation	Excavation	Physical removal of impacted soil. Typical excavation equipment would include backhoes, loaders, and/or dozers. Temporary structures and extraction wells may be used to lower the groundwater to create "dry" areas to allow use of typical excavation equipment to physically remove soil.	Proven process for effectively removing impacted soil.	Implementable. Equipment capable of excavating the soil is readily available.	High capital cost and low O&M costs.	Yes
Ex-Situ On-Site Treatment	Immobilization	Solidification/ Stabilization	Addition of material to the removed soil that limits the solubility or mobility of the constituents present. Involves treating soil to produce a stable, non-leachable material, that physically or chemically locks the constituents within the solidified matrix.	Proven process for effectively reducing mobility and toxicity of organic and select inorganic constituents. Overall effectiveness of this process would need to be evaluated during a bench-scale study. Timeline requirements associated with on-site treatment may not be feasible.	Implementable. Solidification/ stabilization materials are readily available. Space to perform treatment technology is limited.	High capital and O&M costs.	No

TABLE 4-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR SUBSURFACE SOIL

General Response Action	Technology Type	Technology Process Option	Description of Option/Comments	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
Ex-Situ On-Site Treatment (cont'd)	Extraction	Low Temperature Thermal Desorption	Process by which soils containing organics with boiling point temperatures less than 800^{o} Fahrenheit are excavated, conditioned, and heated; the organic compounds are desorbed from the soils into an induced airflow. The resulting gas is treated either by condensation and filtration or by thermal destruction. Treated soils are returned to the subsurface.	Proven process for effectively addressing organic constituents. The efficiency of the system and rate of removal of organic constituents would require evaluation during bench-scale and/or pilot-scale testing. Timeline requirements associated with on-site treatment may limit feasibility of process.	Implementable. Treatment facilities are available. Space to perform treatment technology is limited.	Moderate capital and O&M costs.	No
	Thermal Destruction	Incineration	Use of a mobile incineration unit installed on-site for high temperature thermal destruction of the organic compounds present in the media. Soils are excavated and conditioned prior to incineration. Treated soils are returned to the subsurface.	Proven process for effectively addressing organic constituents. The efficiency of the system and rate of removal of organic constituents would need to be verified during bench-scale and/or pilot-scale testing. Timeline requirements associated with on-site treatment may not meet needs of property.	Not implementable. Limited number of treatment facilities. Space to perform treatment technology is limited.	High capital and O&M costs.	No
Off-Site Treatment and/or Disposal	Recycle/ Reuse	Asphalt Concrete Batch Plant	Soil is used as a raw material in asphalt concrete paving mixtures. The impacted soil is transported to an offsite asphalt concrete facility and can replace part of the aggregate and asphalt concrete fraction. The hot-mix process melts asphalt concrete prior to mixing with aggregate. During the cold-mix process, aggregate is mixed at ambient temperature with an asphalt concrete/water emulsion. Organics and inorganics are bound in the asphalt concrete. Some organics may volatilize in the hot-mix.	Effective for treating organics and inorganics through volatilization and/or encapsulation. Thermal pretreatment may be required to prevent leaching. No long-term data available.	Potentially Implementable. Soil may require conditioning with clean soil to achieve appropriate consistency. Permitted facilities and demand are limited. Screening and disposal of off-spec. materials can be costly.	Moderate capital costs.	Yes

TABLE 4-1

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR SUBSURFACE SOIL

General Response Action	Technology Type	Technology Process Option	Description of Option/Comments	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
Off-Site Treatment and/or Disposal (cont'd)	Recycle/ Reuse (cont'd)	Brick/Concrete Manufacture	Soil is used as a raw material in manufacture of bricks or concrete. Heating in ovens during manufacture volatilizes organics and some inorganics. Other inorganics are bound in the product.	Effective for treating organics and inorganics through volatilization and/or vitrification. A bench-scale/pilot study may be necessary to determine effectiveness.	Potentially Implementable.	Moderate-high capital costs.	Yes
		Co-Burn in Utility Boiler	Soil is blended with feed coal to fire a utility boiler used to generate steam. Organics are destroyed.	Effective for treating organic constituents. Soil would be blended with coal prior to burning. Overall effectiveness of this process would need to be evaluated during a trial burn.	Permitted facilities available for burning MGP soils are limited.	Moderate capital costs.	Yes
	Extraction	Low Temperature Thermal Desorption	Process by which soils containing organics with boiling point temperatures less than 800^{o} Fahrenheit are heated and the organic compounds are desorbed from the soils into an induced airflow. The resulting gas is treated either by condensation and filtration or by thermal destruction.	Proven process for effectively addressing organic constituents.	Implementable. Treatment facilities are available.	Moderate capital costs.	Yes
	Disposal	Solid Waste Landfill	Disposal of impacted soil in an existing permitted non-hazardous landfill.	Proven process that can effectively achieve the RAOs for non-hazardous solid waste.	Implementable	Moderate capital costs.	Yes
		RCRA Landfill	Disposal of impacted soil in an existing RCRA permitted landfill facility.	Proven process that can effectively achieve the RAOs for hazardous waste.	Implementable	Moderate capital costs.	Yes

Note:
1. Shading indicates that technology process has not been retained for development of a remedial alternative.

TABLE 4-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR GROUNDWATER

General Response Action	Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
No Further Action	No Further Action	No Further Action	Alternative would not include any active remedial action. A No Further Action alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives. Consideration of a No Further Action alternative is required by the NCP and USEPA.	Would not achieve the RAOs for groundwater in an acceptable time frame.	Implementable	Low	Yes
Institutional Controls	Institutional Controls	Governmental Controls, Proprietary Controls, Enforcement and Permit Controls, Informational Devices	Institutional controls would include legal and/or administrative controls that mitigate the potential for exposure to impacted materials and/or the potential to jeopardize the integrity of a remedy. Examples of potential institutional controls include establishing land use restrictions, health and safety requirements for subsurface activities, and restrictions on groundwater use and/or extraction.	May be effective for reducing the potential for human exposure. This option would not meet the RAOs for eliminating or reducing, to the extent practicable, the migration of MGP-related COCs or the source of MGP-related impacts. This option may be effective when combined with other process options.	Implementable	Low	Yes
In-Situ Treatment	Biological Treatment	Monitored Natural Attenuation (MNA)	Natural biological, chemical, and physical processes that under favorable conditions, act without human intervention to reduce the mass, volume, concentration, toxicity, and mobility of chemical constituents. Long-term monitoring is required to demonstrate the reduction of impacts caused by COCs.	Could achieve RAOs over extended period of time. Natural attenuation appears to be occurring at the site.	Easily implemented. Would require monitoring to demonstrate reduction of COCs.	Low Capital and O&M costs.	Yes
		Enhanced MNA	Addition of amendments (e.g., nutrients, oxygen) to the subsurface to enhance indigenous microbial populations to improve the rate of natural biodegradation.	Could achieve RAOs over extended period of time. Natural attenuation appears to be occurring at the site.	Easily implemented. Would require monitoring to demonstrate reduction of COCs.	Low Capital and Moderate O&M costs.	Yes
		Biosparging	Air/oxygen injection wells are installed within the dissolved plume to enhance biodegradation of constituents by increasing oxygen availability. Low-flow injection technology may be incorporated. This technology requires long-term operation, monitoring, and maintenance of air/oxygen delivery system.	Access to areas that would require injection wells for this process option to be effective is limited. Could reduce toxicity and volume of dissolved COCs. Presence of subsurface obstructions limits potential locations of application wells.	Implementable. Equipment for installing wells and injecting air/oxygen is readily available.	Low Capital and High O&M costs.	Yes

TABLE 4-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR GROUNDWATER

General Response Action	Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
In-Situ Treatment (cont'd)	Chemical Treatment	Chemical Oxidation	Oxidizing agents are added to oxidize and reduce the mass of organic constituents. *In-situ* chemical oxidation involves the introduction of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate, or potassium permanganate. A bench scale treatability study would be required to evaluate/estimate the amount of oxidizing agent. Large amounts of oxidizing agents are needed to oxidize NAPL.	Would require long-term treatment to reduce constituents unless combined with source removal technology. May not be a cost effective means to achieve the RAOs. Due to small site size, access to areas that would require injection wells for this process option to be effective is limited.	Not implementable. Equipment and materials are readily available; however, the presence of underground obstructions/structures reduces ability to apply and capture unreacted oxidants.	High Capital and O&M costs.	No
	In-Situ Stripping/ Extraction	Dynamic Underground Stripping and Hydrous Pyrolysis/Oxidation (DUS/HPO)	Steam is injected into the subsurface to mobilize contaminants and NAPLs. The mobilized contaminants are captured and constituents are re-condensed, collected, and treated. In addition, HPO can degrade contaminants in subsurface heated zones. In most cases, this technology requires long-term operation and maintenance of on-site injection, collection, and/or treatment systems.	This option would require a pilot scale study to determine effectiveness. Process may result in NAPL and/or dissolved plume migration.	Potentially implementable. Limited space for vapor recovery system and treatment. Presence of underground MGP structures may hinder/impede technology use.	High	No
In-Situ Containment/ Controls	Hydraulic Control	Groundwater Extraction Using Recovery Wells	Provide hydraulic control across dissolved plume by pumping and treating groundwater and NAPL from wells and/or drains. Monitoring wells are also used to determine whether required hydraulic controls have been obtained. Typically requires extensive design/testing to determine required hydraulic gradients and feasibility of achieving those gradients.	Proven process for effectively containing dissolved groundwater plume. Limited space for well installation. Would require pumping and treating large quantities of water over long periods of time. Soil onsite not conducive to NAPL movement.	Not implementable. Materials and equipment required to install extraction wells are readily available. Access for well installation and space to perform water treatment is limited.	High Capital and O&M costs.	No

TABLE 4-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR GROUNDWATER

General Response Action	Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
In-Situ Containment/ Controls (cont'd)	Containment	Slurry Walls	Involves excavating a trench and adding a slurry (e.g., soil/cement-bentonite mixture) to control subsurface groundwater and NAPL flow into or out of an area (e.g., mitigate the potential for NAPL migration). Slurry walls are typically keyed into a low permeability unit (e.g., an underlying silt/clay layer).	Effective for reducing the migration of chemical constituents; however, the presence of underground obstructions, overhead utilities, and limited site space are obstacles to implementation of the technology.	Not implementable due to site logistics. Access for slurry wall installation and space to perform water treatment is limited.	High Capital and O&M costs.	No
Removal	Groundwater and/or NAPL Extraction	Pump and Treatment using Vertical Wells	Vertical wells are installed to recover groundwater and/or NAPL for treatment/disposal.	Effective, but inefficient for recovery/treatment of dissolved plume. Not effective for NAPL recovery. Would require pumping and treating large quantities of water over long periods of time. Implementation of this process could achieve the RAOs over a long period of time.	Not implementable. Space to perform water treatment technology is limited.	Moderate Capital and High O&M costs.	No
		Pump and Treatment using Horizontal Wells	Horizontal wells are utilized to replace a series of conventional vertical wells.	Effective for recovering groundwater; however, not effective for NAPL recovery at this location. Subsurface obstructions may inhibit use of this technology.	Not implementable. Space to perform water treatment is limited.	Moderate Capital and High O&M costs.	No
		Collection Trenches	A zone of higher permeability material is installed within the desired capture area with a perforated collection laterally placed along the base to direct groundwater to a collection area for treatment and/or disposal.	Potentially effective for recovering groundwater for treatment/disposal. Permeability of site soils is not conducive to NAPL movement.	Not implementable. Space to perform water treatment is limited.	Moderate Capital and High O&M costs.	No
		Passive NAPL Removal	NAPL is passively collected in vertical wells and removed.	To date, no NAPL has been recovered from on-site monitoring wells. Site soils not conducive to NAPL movement. Not effective as a "stand alone" technology; however, may increase effectiveness of other technologies. An effective method of removing NAPL, if encountered.	Implementable. Limited space for well installation.	Low Capital and O&M costs.	Yes

TABLE 4-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR GROUNDWATER

General Response Action	Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
Ex-Situ On-Site Treatment	Chemical Treatment	UV/Oxidation	Extraction of groundwater and treatment using oxidation by subjecting groundwater to ultraviolet light and ozone.	Proven process for effectively treating organic compounds. Use of this process may effectively achieve the RAOs. A bench-scale treatability study may be required to evaluate the efficiency of this process and to make project-specific adjustments to the process. May require special provisions for the storage of process chemicals.	Not implementable due to limited space.	High capital and O&M costs.	No
		Chemical Oxidation	Extraction of groundwater and treatment using oxidizing agents. Oxidizing agents are injected into the groundwater treatment train to oxidize and reduce the mass of dissolved organic constituents. *C* hemical oxidation involves the introduction of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate or potassium permanganate. Large amounts of oxidizing agents are needed to oxidize NAPL.	A bench-scale treatability study may be required to evaluate the efficiency of this process and to make project-specific adjustments to the process. May require special provisions for the storage of process chemicals.	Not implementable due to limited space to perform water treatment. May require special provisions for storage of process chemicals.	High capital and high O&M costs.	No
Ex-Situ On-Site Treatment (cont'd)	Physical Treatment	Carbon Adsorption	Extraction of groundwater and treatment using carbon adsorption. Process by which organic constituents are absorbed to the carbon as groundwater is passed through the carbon.	Effective at removing organic constituents. Use of this treatment process may effectively achieve the RAOs when combined with groundwater extraction.	Implementable, although space is limited.	High capital and O&M costs.	No
		Filtration	Extraction of groundwater and treatment using filtration. Process in which the groundwater is passed through a granular media to removed suspended solids by interception, straining, flocculation, and sedimentation activity within the filter.	Effective pre-treatment process to reduce suspended solids. Use of this process along with other processes that address organic constituents could effectively achieve the RAOs.	Not implementable due to limited space. Disposal of solid wastes will be required.	Low capital and moderate O&M costs.	No

TABLE 4-2

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
FEASIBILITY STUDY REPORT

TECHNOLOGY SCREENING EVALUATION FOR GROUNDWATER

General Response Action	Technology Type	Technology Process Option	Description	Effectiveness	Implementability	Relative Cost	Retained for Further Analysis?
Off-Site Treatment and/or Disposal	Groundwater Disposal	Discharge to a local Publicly Owned Treatment Works (POTW)	Treated or untreated water is discharged to a sanitary sewer and treated at a local POTW facility. This technology process option can be used to support long-term technologies (e.g., pump and treat) or short-term activities (e.g., dewatering of excavation areas).	Proven process for effectively disposing of groundwater. Typically requires the least amount of pretreatment because the discharged water will be subjected to additional treatment at the POTW.	Implementable. Equipment and materials necessary to extract, pre-treat (if necessary), and discharge the water to the sewer system are readily available. Discharges to the sewer will require a POTW-issued discharge permit. Space to perform water treatment is limited.	Moderate capital and O&M costs for long-term applications; low to moderate capital and O&M costs for short-term applications.	Yes
		Discharge to a commercially operated treatment/disposal facility.	Treated or untreated water is collected and transported to a commercially operated treatment/disposal facility. This technology process option can be used to support long-term technologies (e.g., pump and treat) or short-term activities (e.g., dewatering of excavation areas).	Proven process for effectively disposing of groundwater. Typically requires the least amount of pretreatment because the discharged water will be subjected to additional treatment at the disposal facility.	Implementable. Equipment and materials to pre-treat the water at the site are readily available on a commercial basis. Facilities capable of transporting and disposing of the groundwater are available. Treatment may be required prior to discharge. Space to perform water treatment is limited.	High capital and O&M costs for long-term applications; moderate capital and O&M costs for short-term applications.	Yes

Note:
1. Shading indicates that technology process has not been retained for development of a remedial alternative.

Table 5-1

Cost Estimate for Alternative SM1
No Further Action

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Item #	Description	Estimated Quantity	Unit	Unit Price (materials and labor)	Estimated Amount
CAPITAL COSTS					
1	Legal/Administrative/Institutional Controls	1	LS	$50,000	$50,000
				Subtotal Capital Cost	$50,000
				Engineering (15%)	$7,500
				Contingency (25%)	$12,500
				Subtotal Cost	$70,000
OPERATION AND MAINTENANCE COSTS					
2	Inspection of Institutional Controls and Notifications to NYSDEC	1	LS	$5,000	$5,000
3	Annual Maintenance of Existing Site Fencing and Gravel Cover	1	LS	$3,000	$3,000
				Total O&M Cost	$8,000
				Contingency (25%)	$2,000
				Subtotal Cost	$10,000
4				30-Year Total Present Worth Cost of O&M	$124,100
				Total Estimated Cost	**$194,100**
				Rounded to	**$190,000**

General Notes:

1. Cost estimate is based on ARCADIS's past experience and vendor estimates using 2008 dollars.

2. This estimate has been prepared for the purpose of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such; this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

Assumptions:

1. Legal/administrative/institutional controls cost estimate includes all labor and materials necessary to institute deed restrictions to prevent current or future site workers from performing intrusive activities that may potentially result in worker exposure to remaining source material.

2. Inspection of institutional controls and notifications to NYSDEC cost estimate includes administrative costs associated with implementing institutional controls to minimize the potential for human exposure to impacted soils. Such institutional controls may include governmental controls, proprietary controls, enforcement tools, and/or informational devices. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective.

3. Annual maintenance of existing site fencing and gravel cover cost estimate includes annual repair/replacement of up to 50 linear-feet of existing site fencing to maintain site security. Cost estimate also includes purchase, importation and placement of up 15 cubic-yards of run-of-crusher gravel to maintain the existing site cover.

4. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

Table 5-2

Cost Estimate for Alternative SM2
Remove Contents of Northern Gas Holder

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Item #	Description	Estimated Quantity	Unit	Unit Price (materials and labor)	Estimated Amount
CAPITAL COSTS					
1	Mobilization/Demobilization	1	LS	$100,000	$100,000
2	Construct and Remove Equipment Decontamination Pad	1	LS	$15,000	$15,000
3	Construction and Maintenance of Material Staging Area	1	LS	$20,000	$20,000
4	Erosion Control	400	LF	$2	$800
5	Temporary Fencing/Removal/Repair	600	LF	$40	$24,000
6	Utility Clearance	1	LS	$15,000	$15,000
7	Demolish At-Grade Slab	650	SF	$15	$9,750
8	Install and Remove Temporary Sheet Pile	1,250	SF	$40	$50,000
9	Internal Sheet Pile Bracing	1	LS	$25,000	$25,000
10	Soil Excavation Dewatering	1	LS	$25,000	$25,000
11	Soil Excavation and Handling	600	CY	$40	$24,000
12	Dust/Vapor/Odor Control	8	Week	$3,000	$24,000
13	Select Fill Importation, Placement, Compaction and Grading	550	CY	$35	$19,250
14	Run-of-Crusher Stone	50	CY	$25	$1,250
15	Solid Waste Characterization	2	Each	$750	$1,500
16	Liquid Waste Characterization	2	Each	$1,000	$2,000
17	Disposal of Wastewater	120,000	gal	$0.15	$18,000
18	Soil Waste Transportation and Disposal - LTTD	1,000	Ton	$100	$100,000
19	Debris Waste Transportation and Disposal - Solid Waste Landfill	50	Ton	$100	$5,000
20	Miscellaneous Waste Disposal	1	LS	$25,000	$25,000
21	Restoration	1	LS	$100,000	$100,000
22	Install Southern Gas Holder Monitoring Well	1	LS	$5,000	$5,000
23	Pre-Design Investigation	1	LS	$100,000	$100,000
24	Administration and Engineering	1	LS	$200,000	$200,000
25	Construction Management/Project Management	2	Month	$35,000	$70,000
26	Legal/Administrative/Institutional Controls	1	LS	$50,000	$50,000
				Subtotal Capital Cost	$1,029,550
				Contingency (25%)	$257,388
				Total Capital Cost	$1,286,938
OPERATION AND MAINTENANCE COSTS					
27	Inspection of Institutional Controls and Notifications to NYSDEC	1	LS	$5,000	$5,000
28	Annual Maintenance of Existing Site Fencing and Gravel Cover	1	LS	$3,000	$3,000
				Subtotal O&M Cost	$8,000
				Contingency (25%)	$2,000
				Subtotal Cost	$10,000
29				30-Year Total Present Worth Cost of O&M	$124,100
				Total Estimated Cost	**$1,411,038**
				Rounded to	**$1,410,000**

Table 5-2

Cost Estimate for Alternative SM2
Remove Contents of Northern Gas Holder

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

General Notes:

1. Cost estimate is based on ARCADIS's past experience and vendor estimates using 2008 dollars.

2. This estimate has been prepared for the purpose of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such; this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

Assumptions:

1. Mobilization/demobilization cost estimate includes mobilization and demobilization of all equipment, materials, and labor necessary to complete soil removal and backfilling activities.

2. Construct and remove equipment decontamination pad cost estimate includes labor, equipment, and materials necessary to construct and remove a 60-foot by 30-foot decontamination pad and appurtenances. The decontamination pad would consist of 40-mil high-density polyethylene (HDPE) with a 6-inch gravel drainage layer placed over the HDPE liner, surrounded by a one-foot high berm and sloped to a collection sump for the collection of decontamination water.

3. Construction and maintenance of material staging area cost estimate includes labor, equipment, and materials to construct an approximate 100-foot by 50-foot material staging area consisting of a 12-inch gravel fill layer bermed and sloped to a sump and covered with a 40-mil HDPE liner. Maintenance costs include inspecting and repairing staging area as necessary and covering staged soil with polyethylene sheeting or odor suppressing foam, as necessary. Cost assumes construction cost of approximately $4 per square foot of pad.

4. Erosion control cost estimate includes labor, equipment, and materials necessary to purchase and install three-foot-high silt fence equipped with wooden stakes placed 10-foot on-center.

5. Temporary site fencing cost estimate includes labor, equipment, and materials necessary to purchase, install, and remove temporary six-foot woven steel chain link fence equipped with top tension wire. Temporary fencing to enclose work area within Hancock Street.

6. Utility clearance cost estimate includes the identification of both aboveground and underground utilities that may potentially be affected by the remedial construction activities and evaluation of their effect on the remedial

7. Demolish at-grade slab cost estimate includes labor, equipment, and materials necessary to demolish the existing concrete slab on-grade in the vicinity of the northern gas holder.

8. Install and remove temporary sheet pile cost estimate includes labor, equipment, and materials necessary to install and remove temporary steel sheet pile. Cost estimate assumes cantilever sheet piling (with an embedment depth of 2.5 times the excavation depth) would be utilized on the western side of the excavation

9. Internal sheet pile bracing cost estimate includes labor, equipment, and materials necessary to install internal sheet pile bracing to support sheet pile during excavation activities.

Table 5-2

Cost Estimate for Alternative SM2
Remove Contents of Northern Gas Holder

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

10. Soil excavation dewatering cost estimate includes rental of temporary water treatment system. Cost estimate assumes water treatment system includes pumps, influent piping and hoses, frac tank, carbon filters, bag filters, discharge piping and hoses, and flow meter. Cost estimate assumes bag filters will require change out approximately once per day of operation.

11. Soil excavation and handling cost estimate includes all labor and equipment necessary to excavate material and transfer excavated material to a material staging area or direct-load material to dump trailers for off-site disposal. Cost estimate is based on in-place soil volume of northern gas holder contents and heavily MGP-impacted material in the immediate vicinity of the northern gas holder.

12. Dust/vapor/odor control cost estimate includes all equipment, labor, and materials necessary to monitor dust/vapor/odor emission during intrusive site activities. Cost estimate includes application of vapor/odor suppressing foam to excavated materials staged on-site.

13. Select fill importation, placement, compaction, and grading cost estimate includes all labor, equipment, and materials necessary to purchase, place, compact and grade general fill to replace excavated material. Cost estimate is based on in-place soil volume.

14. Run-of-crusher stone cost estimate includes all labor, equipment, and materials necessary to purchase, place, and grade 6 inches of run-of-crusher stone to serve as final cover for excavation areas.

15. Solid waste characterization cost estimate includes the analysis of soil samples for PCBs, VOCs, SVOCs, and RCRA Metals. Cost assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal. The estimated weight of material was based on an assumed 1.5 tons per cubic-yard of material plus approximately 10% of the excavated soil weight for addition of soil stabilization materials.

16. Liquid waste characterization cost estimate includes the analysis of water samples including for PCBs, VOCs, SVOCs, metals, pesticides. Liquid waste characterization sampling to be conducted in accordance with requirements to be provided by disposal facility.

17. Disposal of wastewater cost estimate includes transportation and disposal of treated water removed from within the northern gas holder. Volume estimate includes removal of one pore volume of excavation area (interior of northern gas holder) and removal of water from the excavation 3 times during remedial activities.

18. Soil waste transportation and disposal - LTTD cost estimate includes labor, equipment, and materials necessary to transport excavated material off-site for treatment at a low-temperature thermal desorption facility (assumed to be Environmental Soil Management, Inc.'s Fort Edward Facility).

19. Debris waste transportation and disposal - solid waste landfill cost estimate includes labor, equipment, and materials necessary to transport concrete debris from the demolition of the slab-on-grade for off-site disposal at an appropriate landfill. Cost estimate assumes concrete slab is no more than 1 foot thick and has an assumed weight of 2 tons per cubic-yard. Cost estimate includes sizing and conditioning. Cost includes sizing and

Table 5-2

Cost Estimate for Alternative SM2
Remove Contents of Northern Gas Holder

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

20. Miscellaneous waste disposal cost estimate includes disposal of PPE, disposable equipment, and miscellaneous materials at a facility permitted to accept the waste.

21. Restoration cost estimate includes labor, equipment, and materials to repair portions of Hancock Street and sidewalks that may potentially be damaged during remedial construction activities.

22. Install southern gas holder monitoring well includes labor, equipment, and materials necessary to install a permanent monitoring well within the limits of the southern gas holder.

23. Pre-design investigation cost estimate includes labor, equipment, and materials necessary to collect additional information to facilitate completion of the remedial design for this alternative.

24. Administration and engineering cost estimate includes preparation of remedial design and supporting documentation including (but not limited to) Remedial Action Work Plan (including sheet pile design), Health and Safety Plan, and Community Air Monitoring Plan as well remedial contractor procurement and shop drawing review.

25. Construction management/project management cost estimate includes labor and expenses for construction oversight personnel during implementation of remedial activities. Cost estimate includes all transportation, lodging, and meals for construction oversight personnel.

26. Legal/administrative/institutional controls cost estimate includes all labor and materials necessary to institute deed restrictions to prevent current or future site workers from performing intrusive activities that may potentially result in worker exposure to remaining MGP-impacted material.

27. Inspection of institutional controls and notifications to NYSDEC cost estimate includes administrative costs associated with the annual verification of the status of institutional controls and preparing/submitting notification to the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective. Such institutional controls may include governmental controls, proprietary controls, enforcement tools, and/or informational devices.

28. Annual maintenance of existing site fencing and gravel cover cost estimate includes annual repair/replacement of up to 50 linear-feet of existing site fencing to maintain site security. Cost estimate also includes purchase, importation and placement of up 15 cubic-yards of run-of-crusher gravel to maintain the existing site cover.

29. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

Table 5-3

Cost Estimate for Alternative SM3
Remove Northern Gas Holder and MGP-Impacted Material Above Confining Layer on Former MGP Property

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Item #	Description	Estimated Quantity	Unit	Unit Price (materials and labor)	Estimated Amount
CAPITAL COSTS					
1	Mobilization/Demobilization	1	LS	$150,000	$150,000
2	Construct and Remove Equipment Decontamination Pad	1	LS	$15,000	$15,000
3	Construction and Maintenance of Material Staging Area	1	LS	$20,000	$20,000
4	Erosion Control	400	LF	$2	$800
5	Temporary Fencing/Removal/Repair	600	LF	$40	$24,000
6	Utility Clearance	1	LS	$15,000	$15,000
7	Demolish At-Grade Slab	650	SF	$15	$9,750
8	Install and Remove Temporary Sheet Pile	7,200	SF	$40	$288,000
9	Internal Sheet Pile Bracing	1	LS	$75,000	$75,000
10	Soil Excavation Dewatering	2	LS	$50,000	$100,000
11	Soil Excavation and Handling	1,000	CY	$40	$40,000
12	Dust/Vapor/Odor Control	12	Week	$3,000	$36,000
13	Select Fill Importation, Placement, Compaction and Grading	950	CY	$35	$33,250
14	Run-of-Crusher Stone	50	CY	$25	$1,250
15	Solid Waste Characterization	4	Each	$750	$3,000
16	Liquid Waste Characterization	3	Each	$1,000	$3,000
17	Disposal of Wastewater	300,000	gal	$0.15	$45,000
18	Soil Waste Transportation and Disposal - LTTD	1,700	Ton	$100	$170,000
19	Debris Waste Transportation and Disposal - Solid Waste Landfill	50	Ton	$100	$5,000
20	Miscellaneous Waste Disposal	1	LS	$35,000	$35,000
21	Restoration	1	LS	$100,000	$100,000
22	Install Southern Gas Holder Monitoring Well	1	LS	$5,000	$5,000
23	Pre-Design Investigation	1	LS	$250,000	$250,000
24	Administration and Engineering	1	LS	$300,000	$300,000
25	Construction Management/Project Management	4	Month	$35,000	$140,000
26	Legal/Administrative/Institutional Controls	1	LS	$50,000	$50,000
				Subtotal Capital Cost	$1,914,050
				Contingency (25%)	$478,513
				Total Capital Cost	$2,392,563
OPERATION AND MAINTENANCE COSTS					
27	Inspection of Institutional Controls and Notifications to NYSDEC	1	LS	$5,000	$5,000
28	Annual Maintenance of Existing Site Fencing and Gravel Cover	1	LS	$3,000	$3,000
				Subtotal O&M Cost	$8,000
				Contingency (25%)	$2,000
				Subtotal Cost	$10,000
29				30-Year Total Present Worth Cost of O&M	$124,100
				Total Estimated Cost	**$2,516,663**
				Rounded to	**$2,520,000**

Table 5-3

Cost Estimate for Alternative SM3
Remove Northern Gas Holder and MGP-Impacted Material Above Confining Layer on Former MGP Property

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

General Notes:

1. Cost estimate is based on ARCADIS's past experience and vendor estimates using 2008 dollars.

2. This estimate has been prepared for the purpose of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such; this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

Assumptions:

1. Mobilization/demobilization cost estimate includes mobilization and demobilization of all equipment, materials, and labor necessary to complete soil removal and backfilling activities.

2. Construct and remove equipment decontamination pad cost estimate includes labor, equipment, and materials necessary to construct and remove a 60-foot by 30-foot decontamination pad and appurtenances. The decontamination pad would consist of 40-mil high-density polyethylene (HDPE) with a 6-inch gravel drainage layer placed over the HDPE liner, surrounded by a one-foot high berm and sloped to a collection sump for the collection of decontamination water.

3. Construction and maintenance of material staging area cost estimate includes labor, equipment, and materials to construct an approximate 100-foot by 50-foot material staging area consisting of a 12-inch gravel fill layer bermed and sloped to a sump and covered with a 40-mil HDPE liner. Maintenance costs include inspecting and repairing staging area as necessary and covering staged soil with polyethylene sheeting or odor suppressing foam, as necessary. Cost assumes construction cost of approximately $4 per square foot of pad.

4. Erosion control cost estimate includes labor, equipment, and materials necessary to purchase and install three-foot-high silt fence equipped with wooden stakes placed 10-foot on-center.

5. Temporary site fencing cost estimate includes labor, equipment, and materials necessary to purchase, install, and remove temporary six-foot woven steel chain link fence equipped with top tension wire. Temporary fencing to enclose work area within Hancock Street.

6. Utility clearance cost estimate includes the identification of both aboveground and underground utilities that may potentially be affected by the remedial construction activities and evaluate their effect on the remedial activities.

7. Demolish at-grade slab cost estimate includes labor, equipment, and materials necessary to demolish the existing concrete slab on-grade in the vicinity of the northern gas holder.

8. Install and remove temporary sheet pile cost estimate includes labor, equipment, and materials necessary to install and remove temporary steel sheet pile. Cost estimate assumes cantilever sheet piling (with an embedment depth of 2.5 times the excavation depth) would be utilized. Cost estimate assumes northern gas holder and surrounding excavation area sheet piling will be installed to a depth of 45 feet below grade for 160 linear feet. Interior bracing may be required for installation of sheet piling. Sheet pile design to be completed as part of the Remedial Design.

9. Internal sheet pile bracing cost estimate includes labor, equipment, and materials necessary to install internal sheet pile bracing to support sheet pile during excavation activities.

10. Soil excavation dewatering cost estimate includes rental of temporary water treatment system. Cost estimate assumes water treatment system includes pumps, influent piping and hoses, frac tank, carbon filters, bag filters, discharge piping and hoses, and flow meter. Cost estimate assumes bag filters will require change out approximately once per day of operation.

11. Soil excavation and handling cost estimate includes labor and equipment necessary to excavate and transfer excavated material to a material staging area or direct-load material to dump trailers for off-site disposal. Cost assumes excavation area includes the northern gas holder and its contents and heavily MGP-impacted material located above the silt and clay confining layer (assumed 16 feet below grade). Cost estimate is based on in-place soil volume.

12. Dust/vapor/odor control cost estimate includes all equipment, labor, and materials necessary to monitor dust/vapor/odor emission during intrusive site activities. Cost estimate includes application of vapor/odor suppressing foam to excavated materials staged on-site.

13. Select fill importation, placement, compaction, and grading cost estimate includes all labor, equipment, and materials necessary to purchase, place, compact and grade general fill to replace excavated material. Cost estimate is based on in-place soil volume.

14. Run-of-crusher stone cost estimate includes all labor, equipment, and materials necessary to purchase, place, and grade 6 inches of run-of-crusher stone to serve as final cover for excavation areas.

15. Solid waste characterization cost estimate includes the analysis of soil samples for PCBs, VOCs, SVOCs, and RCRA Metals. Cost assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal. The estimated weight of material was based on an assumed 1.5 tons per cubic-yard of material plus approximately 10% of the excavated soil weight for addition of soil stabilization materials.

16. Liquid waste characterization cost estimate includes the analysis of samples for PCBs, VOCs, SVOCs, metals, pesticides. Liquid waste characterization sampling to be conducted in accordance with requirements to be provided by disposal facility.

17. Disposal of wastewater cost estimate includes disposal of treated water generated from soil excavation. Volume estimate includes removal of one pore volume of excavation area following installation of watertight sheet pile and removal of water from the excavation (below the water table) 3 times during remedial activities.

18. Soil waste transportation and disposal - LTTD cost estimate includes labor, equipment, and materials necessary to transport excavated material off-site for treatment at a low-temperature thermal desorption facility (assumed to be Environmental Soil Management, Inc.'s Fort Edward Facility).

19. Debris waste transportation and disposal - solid waste landfill cost estimate includes all labor, equipment, and materials necessary to transport concrete debris from the demolition of the slab-on-grade for off-site disposal at an appropriate landfill. Cost estimate assumes concrete slab is no more than 1 foot thick and has an assumed weight of 2 tons per cubic-yard. Cost estimate includes sizing and conditioning. cost includes sizing and

Table 5-3

Cost Estimate for Alternative SM3
Remove Northern Gas Holder and MGP-Impacted Material Above Confining Layer on Former MGP Property

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

20. Miscellaneous waste disposal cost estimate includes disposal of PPE, disposable equipment, and miscellaneous materials at a facility permitted to accept the waste.

21. Restoration cost estimate includes labor, equipment, and materials to repair portions of Hancock Street and sidewalks that may potentially be damaged during remedial construction activities.

22. Install southern gas holder monitoring well includes labor, equipment, and materials necessary to install a permanent monitoring well within the limits of the southern gas holder.

23. Pre-design investigation cost estimate includes labor, equipment, and materials necessary to collect additional information to facilitate completion of the remedial design for this alternative.

24. Administration and engineering cost estimate includes preparation of remedial design and supporting documentation including (but not limited to) Remedial Action Work Plan (including sheet pile design), Health and Safety Plan, and Community Air Monitoring Plan as well remedial contractor procurement and shop drawing review.

25. Construction management/project management cost estimate includes labor and expenses for construction oversight personnel during implementation of remedial activities. Cost estimate includes all transportation, lodging, and meals for construction oversight personnel.

26. Legal/administrative/institutional controls cost estimate includes all labor and materials necessary to institute deed restrictions to prevent current or future site workers from performing intrusive activities that may potentially result in worker exposure to remaining MGP-impacted material.

27. Inspection of institutional controls and notifications to NYSDEC cost estimate includes administrative costs associated with the annual verification of the status of institutional controls and preparing/submitting notification to the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective. Such institutional controls may include governmental controls, proprietary controls, enforcement tools, and/or informational devices.

28. Annual maintenance of existing site fencing and gravel cover cost estimate includes annual repair/replacement of up to 50 linear-feet of existing site fencing to maintain site security. Cost estimate also includes purchase, importation and placement of up 15 cubic-yards of run-of-crusher gravel to maintain the existing site cover.

29. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

Table 5-4

Cost Estimate for Alternative SM4
Remove Northern Gas Holder and Soil Above 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Item #	Description	Estimated Quantity	Unit	Unit Price (materials and labor)	Estimated Amount
CAPITAL COSTS					
1	Structural Survey	1	LS	$40,000	$40,000
2	Mobilization/Demobilization	1	LS	$200,000	$200,000
3	Construct and Remove Equipment Decontamination Pad	1	LS	$15,000	$15,000
4	Construction and Maintenance of Material Staging Area	1	LS	$20,000	$20,000
5	Erosion Control	800	LF	$2	$1,600
6	Temporary Fencing/Removal/Repair	900	LF	$40	$36,000
7	Utility Clearance	1	LS	$25,000	$25,000
8	Demolish At-Grade Slab	650	SF	$15	$9,750
9	Install and Remove Temporary Sheet Pile	49,900	SF	$50	$2,495,000
10	Internal Sheet Pile Bracing	1	LS	$150,000	$150,000
11	Soil Excavation Dewatering	3	LS	$50,000	$150,000
12	Soil Excavation and Handling	4,600	CY	$40	$184,000
13	Dust/Vapor/Odor Control	30	Week	$3,000	$90,000
14	Select Fill Importation, Placement, Compaction and Grading	4,400	CY	$35	$154,000
15	Run-of-Crusher Stone	200	CY	$25	$5,000
16	Asphalt Parking Lot	550	Ton	$75	$41,250
17	Solid Waste Characterization	16	Each	$750	$12,000
18	Liquid Waste Characterization	12	Each	$1,000	$12,000
19	Disposal of Wastewater	1,200,000	gal	$0.15	$180,000
20	Soil Waste Transportation and Disposal - LTTD	7,600	Ton	$100	$760,000
21	Debris Waste Transportation and Disposal - Solid Waste Landfill	200	Ton	$100	$20,000
22	Miscellaneous Waste Disposal	1	LS	$70,000	$70,000
23	Restoration	1	LS	$200,000	$200,000
24	Install Southern Gas Holder Monitoring Well	1	LS	$5,000	$5,000
25	Pre-Design Investigation	1	LS	$300,000	$300,000
26	Administration and Engineering	1	LS	$400,000	$400,000
27	Construction Management/Project Management	7	Month	$35,000	$245,000
28	Legal/Administrative/Institutional Controls	1	LS	$250,000	$250,000
				Subtotal Capital Cost	$6,070,600
				Contingency (25%)	$1,517,650
				Total Capital Cost	$7,588,250
OPERATION AND MAINTENANCE COSTS					
29	Inspection of Institutional Controls and Notifications to NYSDEC	1	LS	$5,000	$5,000
30	Annual Maintenance of Existing Site Fencing and Gravel Cover	1	LS	$3,000	$3,000
				Subtotal O&M Cost	$8,000
				Contingency (25%)	$2,000
				Subtotal Cost	$10,000
31				30-Year Total Present Worth Cost of O&M	$124,100
				Total Estimated Cost	**$7,712,350**

Table 5-4

Cost Estimate for Alternative SM4
Remove Northern Gas Holder and Soil Above 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Rounded to	**$7,710,000**

Table 5-4

Cost Estimate for Alternative SM4
Remove Northern Gas Holder and Soil Above 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

General Notes:

1. Cost estimate is based on ARCADIS's past experience and vendor estimates using 2008 dollars.

2. This estimate has been prepared for the purpose of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such; this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

Assumptions:

1. Structural survey cost estimate includes all labor necessary to conduct a structural assessment of the restaurant and additional structure located between Hancock and State Streets prior to beginning remedial activities.

2. Mobilization/demobilization cost estimate includes mobilization and demobilization of all equipment, materials, and labor necessary to complete soil removal and backfilling activities.

3. Construct and remove equipment decontamination pad cost estimate includes labor, equipment, and materials necessary to construct and remove a 60-foot by 30-foot decontamination pad and appurtenances. The decontamination pad would consist of 40-mil high-density polyethylene (HDPE) with a 6-inch gravel drainage layer placed over the HDPE liner, surrounded by a one-foot high berm and sloped to a collection sump for the collection of decontamination water.

4. Construction and maintenance of material staging area cost estimate includes labor, equipment, and materials to construct an approximate 100-foot by 50-foot material staging area consisting of a 12-inch gravel fill layer bermed and sloped to a sump and covered with a 40-mil HDPE liner. Maintenance costs include inspecting and repairing staging area as necessary and covering staged soil with polyethylene sheeting or odor suppressing foam, as necessary. Cost assumes construction cost of approximately $4 per square foot of pad.

5. Erosion control cost estimate includes labor, equipment, and materials necessary to purchase and install three-foot-high silt fence equipped with wooden stakes placed 10-foot on-center.

6. Temporary site fencing cost estimate includes labor, equipment, and materials necessary to purchase, install, and remove temporary six-foot woven steel chain link fence equipped with top tension wire. Temporary fencing to enclose work area within Hancock Street and off-site property between Hancock and State Streets.

7. Utility clearance cost estimate includes the identification and temporary relocation of both aboveground and underground utilities that may potentially be affected by the remedial construction activities and evaluate their effect on the remedial activities.

8. Demolish at-grade slab cost estimate includes labor, equipment, and materials necessary to demolish the existing concrete slab on-grade in the vicinity of the northern gas holder.

9. Install and remove temporary sheet pile cost estimate includes labor, equipment, and materials necessary to install and remove temporary steel sheet pile. Cost estimate assumes cantilever sheet piling (with an embedment depth of 2.5 to 3.0 times the excavation depth) would be utilized. For excavations greater than 15 feet below grade, sheet pile will require tie backs and interior bracing. Cost includes an assumed additional 15% of sheet pile for interior sheeting. Sheet pile design to be completed as part of the Remedial Design.

Table 5-4

Cost Estimate for Alternative SM4
Remove Northern Gas Holder and Soil Above 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

10. Internal sheet pile bracing cost estimate includes labor, equipment, and materials necessary to install internal sheet pile bracing to support sheet pile during excavation activities.

11. Soil excavation dewatering cost estimate includes rental of temporary treatment system. Cost estimate assumes water treatment system includes pumps, influent piping and hoses, frac tank, carbon filters, bag filters, discharge piping and hoses, and flow meter. Cost estimate assumes bag filters will require change out approximately once per day of operation. Costs may be incurred over two construction seasons.

12. Soil excavation and handling cost estimate includes all labor and equipment necessary to excavate and transfer excavated material exceeding individual 6 NYCRR Part 375 restricted use (commercial) soil cleanup objectives to a material staging area. Cost estimate is based on in-place soil volume.

13. Dust/vapor/odor control cost estimate includes all equipment, labor, and materials necessary to monitor dust/vapor/odor emission during intrusive site activities. Cost estimate includes application of vapor/odor suppressing foam to excavated materials staged on-site.

14. Select fill importation, placement, compaction, and grading cost estimate includes all labor, equipment, and materials necessary to purchase, place, compact and grade general fill to replace excavated material. Cost estimate is based on in-place soil volume.

15. Run-of-crusher stone cost estimate includes all labor, equipment, and materials necessary to purchase, place, and grade 6 inches of run-of-crusher stone to serve as final cover for excavation areas.

16. Asphalt parking lot cost estimate includes labor, equipment, and materials necessary to install a new parking lot in the off-site area between Hancock and State Streets. Cost assumes parking lot will consist of asphalt base course (assumed 4-inch thickness) and top course (assumed 2-inch thickness). Cost assumes asphalt weight of 2 tons per cubic-yard.

17. Solid waste characterization cost estimate includes the analysis of soil samples for PCBs, VOCs, SVOCs, and RCRA Metals. Cost assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal. The estimated weight of material was based on an assumed 1.5 tons per cubic-yard of material plus approximately 10% of the excavated soil weight for addition of soil stabilization materials.

18. Liquid waste characterization cost estimate includes the analysis of samples for PCBs, VOCs, SVOCs, metals, pesticides. Liquid waste characterization sampling to be conducted in accordance with requirements to be provided by disposal facility.

19. Disposal of wastewater cost estimate includes disposal of treated water generated from soil excavation. Volume estimate includes removal of one pore volume of excavation areas following installation of watertight sheet pile and removal of water from the excavation 3 times during remedial activities.

20. Soil waste transportation and disposal - LTTD cost estimate includes labor, equipment, and materials necessary to transport excavated material off-site for treatment at a low-temperature thermal desorption facility (assumed to be Environmental Soil Management, Inc.'s Fort Edward Facility).

21. Debris waste transportation and disposal - solid waste landfill cost estimate includes labor, equipment, and materials necessary to transport concrete debris from the demolition of the slab-on-grade and other demolition debris generated during remedial activities for off-site disposal at an appropriate landfill. Cost estimate assumes concrete slab is no more than 1 foot thick and material has an assumed weight of 2 tons per cubic-yard. Cost estimate includes sizing and conditioning. Cost includes sizing and conditioning.

Table 5-4

Cost Estimate for Alternative SM4
Remove Northern Gas Holder and Soil Above 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives for Commercial Use

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

22. Miscellaneous waste disposal cost estimate includes disposal of PPE, disposable equipment, and miscellaneous materials at a facility permitted to accept the waste.

23. Restoration cost estimate includes labor, equipment, and materials to repair portions of Hancock Street, State Street, and sidewalks that may potentially be damaged during remedial construction activities.

24. Install southern gas holder monitoring well includes labor, equipment, and materials necessary to install a permanent monitoring well within the limits of the southern gas holder.

25. Pre-design investigation cost estimate includes labor, equipment, and materials necessary to collect additional information to facilitate completion of the remedial design for this alternative.

26. Administration and engineering cost estimate includes preparation of remedial design and supporting documentation including (but not limited to) Remedial Action Work Plan (including sheet pile design), Health and Safety Plan, and Community Air Monitoring Plan as well remedial contractor procurement and shop drawing review.

27. Construction management/project management cost estimate includes labor and expenses for construction oversight personnel during implementation of remedial activities. Cost estimate includes all transportation, lodging, and meals for construction oversight personnel.

28. Legal/administrative/institutional controls cost estimate includes all labor and materials necessary to institute deed restrictions to prevent current or future site workers from performing intrusive activities that may potentially result in worker exposure to remaining MGP-impacted material.

29. Inspection of institutional controls and notifications to NYSDEC cost estimate includes administrative costs associated with the annual verification of the status of institutional controls and preparing/submitting notification to the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective. Such institutional controls may include governmental controls, proprietary controls, enforcement tools, and/or informational devices.

30. Annual maintenance of existing site fencing and gravel cover cost estimate includes annual repair/replacement of up to 50 linear-feet of existing site fencing to maintain site security. Cost estimate also includes purchase, importation and placement of up 15 cubic-yards of run-of-crusher gravel to maintain the existing site cover.

31. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

Table 5-5

Cost Estimate for Alternative SM5
Remove Northern and Southern Gas Holders and
Soil Above 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives From the Former MGP Property

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Item #	Description	Estimated Quantity	Unit	Unit Price (materials and labor)	Estimated Amount
CAPITAL COSTS					
1	Mobilization/Demobilization	1	LS	$200,000	$200,000
2	Construct and Remove Equipment Decontamination Pad	1	LS	$15,000	$15,000
3	Construction and Maintenance of Material Staging Area	1	LS	$20,000	$20,000
4	Erosion Control	800	LF	$2	$1,600
5	Temporary Fencing/Removal/Repair	800	LF	$40	$32,000
6	Demolish At-Grade Slab	650	SF	$15	$9,750
7	Demolish Retaining Wall	1	LS	$10,000	$10,000
8	Install and Remove Temporary Sheet Pile	26,300	SF	$50	$1,315,000
9	Internal Sheet Pile Bracing	1	LS	$500,000	$500,000
10	Soil Excavation Dewatering	3	LS	$50,000	$150,000
11	Soil Excavation and Handling	3,800	CY	$45	$171,000
12	Dust/Vapor/Odor Control	22	Week	$3,000	$66,000
13	Select Fill Importation, Placement, Compaction and Grading	3,650	CY	$35	$127,750
14	Run-of-Crusher Stone	150	CY	$25	$3,750
15	Solid Waste Characterization	13	Each	$750	$9,750
16	Liquid Waste Characterization	14	Each	$1,000	$14,000
17	Disposal of Wastewater	1,400,000	gal	$0.15	$210,000
18	Soil Waste Transportation and Disposal - LTTD	3,200	Ton	$100	$320,000
19	Solid Waste Transportation and Disposal - Solid Waste Landfill	1,600	Ton	$75	$120,000
20	Debris Waste Transportation and Disposal - Solid Waste Landfill	1,600	Ton	$100	$160,000
21	Miscellaneous Waste Disposal	1	LS	$100,000	$100,000
22	Restoration	1	LS	$400,000	$400,000
23	Pre-Design Investigation	1	LS	$500,000	$500,000
24	Administration and Engineering	1	LS	$500,000	$500,000
25	Construction Management/Project Management	5	Month	$35,000	$175,000
26	Legal/Administrative/Institutional Controls	1	LS	$250,000	$250,000
				Subtotal Capital Cost	$5,380,600
				Contingency (25%)	$1,345,150
				Total Capital Cost	$6,725,750
OPERATION AND MAINTENANCE COSTS					
27	Inspection of Institutional Controls and Notifications to NYSDEC	1	LS	$5,000	$5,000
28	Annual Maintenance of Existing Site Fencing and Gravel Cover	1	LS	$3,000	$3,000
				Subtotal O&M Cost	$8,000
				Contingency (25%)	$2,000
				Subtotal Cost	$10,000
29				30-Year Total Present Worth Cost of O&M	$124,100
				Total Estimated Cost	**$6,849,850**
				Rounded to	**$6,850,000**

Table 5-5

Cost Estimate for Alternative SM5
Remove Northern and Southern Gas Holders and
Soil Above 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives From the Former MGP Property

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

General Notes:

1. Cost estimate is based on ARCADIS's past experience and vendor estimates using 2008 dollars.

2. This estimate has been prepared for the purpose of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such; this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

3. The cost esimate prepared for this alternative is only associated with removal of the northern and southern gas holders and soil containing constituents exceeding their respective 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives. It is not feasible to provide a cost estimate to dismantle and relocate the electrical substation at this time due to unknown siting, permitting, temporary electrical supply, regulatory, and other issues that are not within the scope of this feasibility study. These unknown costs are expected to significantly increase the cost of Alternative SM5.

Assumptions:

1. Mobilization/demobilization cost estimate includes mobilization and demobilization of all equipment, materials, and labor necessary to facilitate soil removal and backfilling activities.

2. Construct and remove equipment decontamination pad cost estimate includes labor, equipment, and materials necessary to construct and remove a 60-foot by 30-foot decontamination pad and appurtenances. The decontamination pad would consist of 40-mil high-density polyethylene (HDPE) with a 6-inch gravel drainage layer placed over the HDPE liner, surrounded by a one-foot high berm and sloped to a collection sump for the collection of decontamination water.

3. Construction and maintenance of material staging area cost estimate includes labor, equipment, and materials to construct an approximate 100-foot by 50-foot material staging area consisting of a 12-inch gravel fill layer bermed and sloped to a sump and covered with a 40-mil HDPE liner. Maintenance costs include inspecting and repairing staging area as necessary and covering staged soil with polyethylene sheeting or odor suppressing foam, as necessary. Cost assumes construction cost of approximately $4 per square foot of pad.

4. Erosion control cost estimate includes labor, equipment, and materials necessary to purchase and install three-foot-high silt fence equipped with wooden stakes placed 10-foot on-center.

5. Temporary site fencing cost estimate includes labor, equipment, and materials necessary to purchase, install, and remove temporary six-foot woven steel chain link fence equipped with top tension wire. Temporary fencing to enclose the site and the work area within Hancock Street.

6. Demolish at-grade slab cost estimate includes labor, equipment, and materials necessary to demolish the existing concrete slab on-grade in the vicinity of the northern gas holder.

7. Demolish retaining wall cost estimate includes labor, equipment, and material necessary to demolish the concrete retaining wall located in the southern portion of the MGP property.

Table 5-5

Cost Estimate for Alternative SM5
Remove Northern and Southern Gas Holders and
Soil Above 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives From the Former MGP Property

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

8. Install and remove temporary sheet pile cost estimate includes labor, equipment, and materials necessary to install and remove temporary steel sheet pile. Cost estimate assumes cantilever sheet piling (with an embedment depth of 2.5 times the excavation depth) would be utilized and reinforced with tie backs and interior bracing. Cost includes an assumed additional 15% of sheet pile for interior sheeting. Sheet pile design to be completed as part of the Remedial Design.

9. Internal sheet pile bracing cost estimate includes all labor, equipment, and materials necessary to install internal sheet pile bracing to support sheet pile during excavation activities. Sheet pile design to be completed as part of the Remedial Design.

10. Soil excavation dewatering cost estimate includes rental of temporary treatment system. Cost estimate assumes water treatment system includes pumps, influent piping and hoses, frac tank, carbon filters, bag filters, discharge piping and hoses, and flow meter. Cost estimate assumes bag filters will require change out approximately once per day of operation.

11. Soil excavation and handling cost estimate includes labor and equipment necessary to excavate and transfer material exceeding individual 6 NYCRR Part 375 unrestricted use soil cleanup objectives to a material staging area. Cost estimate is based on in-place soil volume. Cost estimate includes an increased cost to account for the removal of anticipated subsurface structures.

12. Dust/vapor/odor control cost estimate includes equipment, labor, and materials necessary to monitor dust/vapor/odor emission during intrusive site activities. Cost estimate includes application of vapor/odor suppressing foam to excavated materials staged on-site.

13. Select fill importation, placement, compaction, and grading cost estimate includes labor, equipment, and materials necessary to purchase, place, compact and grade general fill to replace excavated material to within 6 inches of the final grade. Cost estimate is based on in-place soil volume.

14. Run-of-crusher stone cost estimate includes labor, equipment, and materials necessary to purchase, place, and grade 6 inches of run-of-crusher stone to serve as final cover for excavation areas.

15. Solid waste characterization cost estimate includes the analysis of soil samples for PCBs, VOCs, SVOCs, and RCRA Metals. Cost assumes that waste characterization samples would be collected at a frequency of one sample per every 500 tons of material destined for off-site disposal. The estimated weight of material was based on an assumed 1.5 tons per cubic-yard of material plus approximately 10% of the excavated soil weight for addition of soil stabilization materials.

16. Liquid waste characterization cost estimate includes the analysis of samples for PCBs, VOCs, SVOCs, metals, pesticides. Liquid waste characterization sampling to be conducted in accordance with requirements to be provided by disposal facility.

17. Disposal of wastewater cost estimate includes disposal of treated water generated from soil excavation. Volume estimate includes removal of one pore volume of excavation areas following installation of water-tight sheet pile and removal of water from the excavation up to 3 times during remedial activities.

18. Soil waste transportation and disposal - LTTD cost estimate includes labor, equipment, and materials necessary to transport excavated material off-site for treatment at a low-temperature thermal desorption facility (assumed to be Environmental Soil Management, Inc.'s Fort Edward Facility). Cost estimate assumes that 50% of all excavated material will be disposed of via LTTD.

Table 5-5

Cost Estimate for Alternative SM5
Remove Northern and Southern Gas Holders and
Soil Above 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives From the Former MGP Property

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

19. Solid waste transportation and disposal - solid waste landfill cost estimate includes labor, equipment, and materials necessary to transport excavated soil generated during remedial activities for off-site disposal as landfill cover material. Cost estimate assumes 25% of all excavated material would be disposed of at a solid waste landfill.

20. Debris waste transportation and disposal - solid waste landfill cost estimate includes labor, equipment, and materials necessary to transport concrete debris from the demolition of the slab-on-grade and other demolition debris (assumed to be 25% of all excavated material) generated during remedial activities for off-site disposal at an appropriate landfill. Cost estimate assumes concrete slab is no more than 1 foot thick and material has an assumed weight of 2 tons per cubic-yard. Cost estimate includes sizing and conditioning.

21. Miscellaneous waste disposal cost estimate includes disposal of PPE, disposable equipment, and miscellaneous materials at a facility permitted to accept the waste.

22. Restoration cost estimate includes labor, equipment, and materials to repair portions of Hancock Street, State Street, and sidewalks that may potentially be damaged during remedial construction activities.

23. Pre-design investigation cost estimate includes labor, equipment, and materials necessary to collect additional information to facilitate completion of the remedial design for this alternative.

24. Administration and engineering cost estimate includes preparation of remedial design and supporting documentation including (but not limited to) Remedial Action Work Plan (including sheet pile design), Health and Safety Plan, and Community Air Monitoring Plan as well remedial contractor procurement and shop drawing review.

25. Construction management/project management cost estimate includes all labor and expenses for construction oversight personnel during implementation of remedial activities. Cost estimate includes all transportation, lodging, and meals for construction oversight personnel.

26. Legal/administrative/institutional controls cost estimate includes all labor and materials necessary to institute deed restrictions to prevent current or future site workers from performing intrusive activities that may potentially result in worker exposure to remaining MGP-impacted material.

27. Inspection of institutional controls and notifications to NYSDEC cost estimate includes administrative costs associated with the annual verification of the status of institutional controls and preparing/submitting notification to the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective. Such institutional controls may include governmental controls, proprietary controls, enforcement tools, and/or informational devices.

28. Annual maintenance of existing site fencing and gravel cover cost estimate includes annual repair/replacement of up to 50 linear-feet of existing site fencing to maintain site security. Cost estimate also includes purchase, importation and placement of up 15 cubic-yards of run-of-crusher gravel to maintain the existing site cover.

29. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

Table 5-6

Cost Estimate for Alternative GW1
No Further Action

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Item #	Description	Estimated Quantity	Unit	Unit Price (materials and labor)	Estimated Amount
CAPITAL COSTS					
1	Legal/Administrative/Institutional Controls	1	LS	$50,000	$50,000
				Subtotal Capital Cost	$50,000
				Contingency (25%)	$12,500
				Total Capital Cost	$62,500
OPERATION AND MAINTENANCE COSTS					
2	Inspection of Institutional Controls and Notifications to NYSDEC	1	LS	$5,000	$5,000
				Subtotal O&M Cost	$5,000
				Contingency (25%)	$1,250
				Subtotal Cost	$6,250
3				30-Year Total Present Worth Cost of O&M	$77,563
				Total Estimated Cost	**$140,063**
				Rounded to	**$140,000**

<u>General Notes:</u>

1. Cost estimate is based on ARCADIS's past experience and vendor estimates using 2008 dollars.

2. This estimate has been prepared for the purpose of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such; this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

<u>Assumptions:</u>

1. Legal/administrative/institutional controls cost estimate includes all labor and materials necessary to institute deed restrictions to prevent future use of site groundwater.

2. Inspection of institutional controls and notifications to NYSDEC cost estimate includes administrative costs associated with implementing institutional controls to minimize the potential for human exposure to impacted soils. Such institutional controls may include governmental controls, proprietary controls, enforcement tools, and/or informational devices. Annual costs associated with institutional controls include verifying the status of institutional controls and preparing/submitting notification to the NYSDEC to demonstrate that the institutional controls are being maintained and remain effective.

3. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

Table 5-7

Cost Estimate for Alternative GW2
Monitored Natural Attenuation

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Item #	Description		Unit	Unit Price (materials and labor)	Estimated Amount
CAPITAL COSTS					
1	Installation/Replacement of Monitoring Wells	1	LS	$10,000	$10,000
2	Legal/Administrative/Institutional Controls	1	LS	$50,000	$50,000
				Subtotal Capital Cost	$60,000
				Contingency (25%)	$15,000
				Total Capital Cost	$75,000
OPERATION AND MAINTENANCE COSTS (YEARS 1 - 5)					
3	Semi-Annual Groundwater Monitoring Field Activities	2	LS	$12,000	$24,000
4	Laboratory Analysis	24	Each	$850	$20,400
5	Waste Disposal	1	LS	$250	$250
6	Annual Groundwater Monitoring Report	1	LS	$8,000	$8,000
				Subtotal O&M Cost	$52,650
				Contingency (25%)	$13,163
				Subtotal Cost	$65,813
7				5-Year Total Present Worth Cost of O&M	$269,831
OPERATION AND MAINTENANCE COSTS (YEARS 6 - 30)					
8	Annual Groundwater Monitoring	1	LS	$10,000	$10,000
9	Laboratory Analysis	10	Each	$850	$8,500
10	Waste Disposal	1	LS	$250	$250
11	Annual Groundwater Monitoring Report	1	LS	$8,000	$8,000
				Subtotal O&M Cost	$26,750
				Contingency (25%)	$6,688
				Subtotal Cost	$33,438
12				30-Year Total Present Worth Cost of O&M (Years 6 - 30)	$277,866
				Total O&M Cost	$547,697
				Total Estimated Cost	**$622,697**
				Rounded to	**$620,000**

General Notes:

1. Cost estimate is based on ARCADIS's past experience and vendor estimates using 2008 dollars.

2. This estimate has been prepared for the purpose of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such; this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

Assumptions:

1. Installation/replacement of monitoring wells cost estimate includes labor, equipment, and materials necessary to install two (2) monitorings wells to replace existing monitoring wells that are lost or damaged as a result of remedial activities.

Table 5-7

Cost Estimate for Alternative GW2
Monitored Natural Attenuation

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

2. Legal/administrative/institutional controls cost estimate includes labor and materials necessary to institute deed restrictions to prevent future use of site groundwater.

3. Semi-annual groundwater monitoring field activities cost estimate includes labor, equipment, and materials necessary to collect groundwater samples from eight (8) site monitoring wells and gauge (and remove NAPL if present) from the proposed southern gas holder monitoring well. Cost estimate assumes two field technicians will require 4 days to complete sample collection activities.

4. Laboratory analysis cost estimate includes labor, equipment, and materials necessary to submit groundwater samples to an analytical laboratory for analysis of chemical constituents of concern (BTEX compounds and PAHs) and natural attenuation indicator parameters. Cost assumes standard analytical turnaround time. Estimate includes cost for laboratory analysis of duplicate, matrix spike/matrix spike duplicate (MS/MSD), trip blank, and field blank samples.

5. Waste disposal cost estimate includes labor, equipment, and materials necessary to dispose of PPE and wastewater generated during annual groundwater monitoring activities. Cost estimate assumes monitoring activities will generate one drum of waste material per year.

6. Annual groundwater monitoring report cost estimate includes labor necessary to prepare an annual report summarizing the results of the groundwater monitoring activities and observed trends. Cost includes data review/DUSR preparation.

7. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

8. Annual groundwater monitoring field activities cost estimate includes all labor, equipment, and materials necessary to collect groundwater samples from up to six (6) existing site monitoring wells and gauge the proposed southern gas holder monitoring well. Cost estimate assumes two field technicians will require 3 days to complete sample collection activities.

9. Laboratory analysis cost estimate includes all labor, equipment, and materials necessary to submit groundwater samples to an analytical laboratory for analysis of the groundwater samples for chemical constituents of concern (BTEX compounds and PAHs) and natural attenuation indicator parameters (i.e., total biomass, PAH-degrading indicator compounds). Cost assumes standard analytical turnaround time. Estimate includes cost for laboratory analysis of duplicate, matrix spike/matrix spike duplicate (MS/MSD), trip blank, and field blank samples. No costs have been included for data validation.

10. Waste disposal cost estimate includes all labor, equipment, and materials necessary to dispose of PPE and wastewater generated during annual groundwater monitoring activities. Cost estimate assumes monitoring activities will generate one drum of waste material per year.

11. Annual groundwater monitoring report cost estimate includes all labor necessary to prepare an annual report summarizing the results of the groundwater monitoring activities and observed trends.

12. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

Table 5-8

Cost Estimate for Alternative GW3
Enhanced Natural Degradation

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Item #	Description	Estimated Quantity	Unit	Unit Price (materials and labor)	Estimated Amount
CAPITAL COSTS					
1	Permitting	1	LS	$5,000	$5,000
2	Oxygen Releasing Compound Pilot Testing	1	LS	$200,000	$200,000
3	Installation of Application Wells	13	Each	$3,500	$45,500
4	Administration and Engineering	1	LS	$100,000	$100,000
5	Asphalt Parking Lot	550	Ton	$75	$41,250
6	Legal/Administrative/Institutional Controls	1	LS	$50,000	$50,000
				Subtotal Capital Cost	$441,750
				Contingency (25%)	$110,438
				Total Capital Cost	$552,188
OPERATION AND MAINTENANCE COSTS (YEARS 1 - 5)					
7	Semi-Annual Groundwater Monitoring Field Activities	2	LS	$12,500	$25,000
8	Laboratory Analysis	24	Each	$850	$20,400
9	Waste Disposal	1	LS	$250	$250
10	Annual Groundwater Monitoring Reporting	1	LS	$10,000	$10,000
				Subtotal O&M Cost	$55,650
				Contingency (25%)	$13,913
				Subtotal Cost	$69,563
11				5-Year Total Present Worth Cost of O&M	$285,206
OPERATION AND MAINTENANCE COSTS (YEARS 6 - 30)					
12	Oxygen Application (Every 4 Months)	78	Each	$350	$27,300
13	Annual Groundwater Monitoring Field Activities	1	LS	$12,500	$12,500
14	Laboratory Analysis	12	Each	$850	$10,200
15	Waste Disposal	1	LS	$250	$250
16	Annual Groundwater Monitoring Reporting	1	LS	$15,000	$15,000
				Subtotal O&M Cost	$65,250
				Contingency (25%)	$16,313
				Subtotal Cost	$81,563
17				30-Year Total Present Worth Cost of O&M (Years 6 - 30)	$677,784
				Total O&M Cost	$962,991
				Total Estimated Cost	**$1,515,178**
				Rounded to	**$1,520,000**

General Notes:

1. Cost estimate is based on ARCADIS's past experience and vendor estimates using 2008 dollars.

2. This estimate has been prepared for the purpose of comparing potential remedial alternatives. The information in this cost estimate is based on the available information regarding the site investigation and the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This cost estimate is expected to be within -30% to +50% of the actual projected cost. Utilization of this cost estimate information beyond the stated purpose is not recommended. ARCADIS is not licensed to provide financial or legal consulting services; as such; this cost estimate information is not intended to be utilized for complying with financial reporting requirements associated with liability services.

Table 5-8

Cost Estimate for Alternative GW3
Enhanced Natural Degradation

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

Assumptions:

1. Permitting cost estimate includes costs to obtain the necessary permits for administering oxygen-releasing compounds to groundwater via on-site wells.

2. Oxygen releasing compound pilot testing cost estimate includes labor, equipment, and materials necessary complete on-site pilot testing of the oxygen releasing compound delivery system. The scope of the pilot testing activities would be determined as part of the remedial design. Pilot testing activities are anticipated to include work plan preparation, application and performance monitoring well installation, oxygen application, groundwater sampling and laboratory analysis, and reporting. Pilot testing anticipated to be conducted in Year 6.

3. Installation of application wells cost estimate includes labor, equipment, and materials necessary to install 4-inch diameter PVC application wells. Cost estimate assumes that application wells will be installed via hollow-stem drilling methods to a depth up to 25 feet below ground surface. Cost assumes application wells will be installed on the former MGP property along the western side of Hancock Street and off the former MGP property approximately 30 feet east of Hancock Street. Installation activities anticipated to be completed in Year 6. cost includes well development.

4. Administration and engineering cost estimate includes preparation of remedial design and supporting documentation including (but not limited to) Remedial Action Work Plan and Health and Safety Plan.

5. Asphalt parking lot cost estimate includes labor, equipment, and materials necessary to install a new parking lot in the area between Hancock and State Streets. Cost assumes parking lot will consist of asphalt base course (assumed 4-inch thickness) and top course (assumed 2-inch thickness). Cost assumes asphalt weight of 2 tons per cubic-yard.

6. Legal expenses for deed restrictions cost estimate includes all labor and materials necessary to institute deed restrictions to prevent future use of site groundwater.

7. Semi-annual groundwater monitoring field activities cost estimate includes labor, equipment, and materials necessary to gauge collect groundwater samples from eight (8) site monitoring wells, and remove NAPL if present from the proposed southern gas holder monitoring well. Cost estimate assumes two field technicians will require 4 days to complete sample collection activities.

8. Laboratory analysis cost estimate includes labor, equipment, and materials necessary to submit groundwater samples to an analytical laboratory for analysis of the chemical constituents of concern (BTEX compounds and PAHs) and natural attenuation indicator parameters. Cost assumes standard analytical turnaround time. Estimate includes cost for laboratory analysis of duplicate, matrix spike/matrix spike duplicate (MS/MSD), trip blank, and field blank samples.

9. Waste disposal cost estimate includes labor, equipment, and materials necessary to dispose of PPE and wastewater generated during annual groundwater monitoring activities. Cost estimate assumes monitoring activities will generate one drum of waste material per year.

10. Annual groundwater monitoring report cost estimate includes labor necessary to prepare an annual report summarizing the results of the groundwater monitoring activities and observed trends. Cost includes data review/DUSR preparation.

Table 5-8

Cost Estimate for Alternative GW3
Enhanced Natural Degradation

National Grid - Fort Plain Former MGP Site
Fort Plain, New York

11. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.

12. Oxygen application cost estimate includes labor, equipment, and materials necessary to install two three-foot long canisters of oxygen-releasing compounds in each of the application wells. Cost estimate assumes that canisters will be replaced every 4 months. Initial oxygen application anticipated to be conducted immediately following installation of application wells (anticipated to be completed in Year 6).

13. Semi-annual groundwater monitoring field activities cost estimate includes labor, equipment, and materials necessary to collect groundwater samples from eight (8) site monitoring wells and gauge (and remove NAPL if present) the proposed southern gas holder monitoring well. Cost estimate assumes two field technicians will require 4 days to complete sample collection activities.

14. Laboratory analysis cost estimate includes labor, equipment, and materials necessary to submit groundwater samples to an analytical laboratory for analysis of the chemical constituents of concern (BTEX compounds and PAHs) and natural attenuation indicator parameters. Cost assumes standard analytical turnaround time. Estimate includes cost for laboratory analysis of duplicate, matrix spike/matrix spike duplicate (MS/MSD), trip blank, and field blank samples.

15. Waste disposal cost estimate includes labor, equipment, and materials necessary to dispose of PPE and wastewater generated during annual groundwater monitoring activities. Cost estimate assumes monitoring activities will generate one drum of waste material per year.

16. Annual groundwater monitoring report cost estimate includes labor necessary to prepare an annual report summarizing the results of the groundwater monitoring activities and observed trends. Cost includes data

17. Present worth is estimated based on a 7% beginning-of-year discount rate (adjusted for inflation) in accordance with OSWER Directive 9355.3-20 "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA, 1993). It is assumed that "year zero" is 2008.